Volume III SEPTEMBER 1942 Number 9.

DISEASES OF THE NERVOUS SYSTEM

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

PUBLISHED MONTHLY for the PHYSICIAN in the GENERAL PRACTICE of MEDICINE

IN THIS ISSUE:

A SYMPOSIUM ON NEUROSYPHILIS

Presented by

The Massachusetts Society for Research in Psychiatry

— — —

Complete Table of Contents on Page 257

ASSOCIATE EDITORS

PETER BASSOE, M.D. ..... Chicago, Illinois
A. E. BENNETT, M.D. ..... Omaha, Nebraska
FRANKLIN G. EBAUGH, M.D. ..... Denver, Colorado
O. SPURGEON ENGLISH, M.D. ..... Philadelphia, Penn.
TEMPLE FAY, M.D. ..... Philadelphia, Penn.
HAMILTON FORD, M.D. ..... Galveston, Texas
WALTER FREEMAN, M.D. ..... Washington, D. C.
JAS. K. HALL, M.D. ..... Richmond, Virginia
GEORGE T. HARDING, M.D. ..... Columbus, Ohio
A. HAUSER, M.D. ..... Houston, Texas
EUGEN KAHN, M.D. ..... New Haven, Connecticut
LOUIS J. KARNOSH, M.D. ..... Cleveland, Ohio
JACOB KASANIN, M.D. ..... San Francisco, California
H. BECKETT LANG, M.D. ..... Albany, N. Y.
FRANK H. LUTON, M.D. ..... Nashville, Tennessee
WM. MALAMUD, M.D. ..... Worcester, Massachusetts
DONALD McEACHERN, M.D. ..... Montreal, Canada
KARL A. MENNINGER, M.D. ..... Topeka, Kansas
ADOLF MEYER, M.D. ..... Baltimore, Maryland
GLENN MYERS, M.D. ..... Los Angeles, California
HANS H. REESE, M.D. ..... Madison, Wisconsin
PAUL L. SCHROEDER, M.D. ..... Chicago, Illinois
THEODORE A. WATTERS, M.D. ..... New Orleans, La.
WM. WALTER YOUNG, M.D. ..... Atlanta, Georgia

TITUS H. HARRIS, M.D.
Galveston, Texas
EDITOR-IN-CHIEF

YEARLY SUBSCRIPTION $2.50
SINGLE COPIES 25 Cents

MURRAY KORNFELD
Chicago, Illinois
MANAGING EDITOR

THE

RING SANATORIUM AND HOSPITAL

Arlington Massachusetts

Eight miles from Boston at an elevation of 400 feet

63rd Year

Specializing in the individualized care of Neuropsychiatric illnesses and Habit conditions. All accepted Therapies under the direction of a resident medical staff and trained assistants. Cottage plan permits a variety of accomodations.

VOLTA ROSS HALL, M.D.
Acting Medical Director

HALLAM T. RING
Administrator

In conjunction: The Ring School of Psychiatric Nursing

WADSWORTH SANITARIUM

SOUTH NORWALK CONNECTICUT

NORWALK 6-0210

Forty-Five miles from New York, on Moss Hill, overlooking Long Island Sound

A private institution for the study and treatment of personality problems. Psychotherapy is supplemented with attractive surroundings, careful nursing, occupational therapy, and hydrotherapy. There are three modern buildings, and a 140-acre farm in conjunction supplies milk and fresh vegetables.

For carefully selected cases, insulin, metrazol, electric shock, and fever therapy are available.

ERIC L. BERNSTEIN, M.D.
Medical Director

New York Office
By Appointment
37 West 72nd Street

COMPTON SANITARIUM
AND
LAS CAMPANAS HOSPITAL

COMPTON, CALIFORNIA
(Near Los Angeles)

Compton Sanitarium is a private psychiatric hospital with 120 beds. Emphasis is given psychotherapy by a staff of resident psychiatrists. Other treatment procedures are duly evaluated and administered. Careful records are maintained. There are psychiatrically trained graduate nurses; student nurses through affiliation; nursing attendants; dietitian; occupational therapist; recreational therapist; hydrotherapist; masseuse. Las Campanas Hospital (30 beds) provides adjunct general hospital facilities. Compton Sanitarium and Las Campanas Hospital are approved by the American College of Surgeons.

GLENN MYERS, M.D.
Medical Director.

Beverly Hills Sanitarium

for

The Study and Treatment of Nervous and Mental Diseases

218 No. Westmoreland DALLAS, TEXAS Telephone 9-3114

This sanitarium is a psychopathic hospital with a home-like environment and is equipped to treat psychiatric and neurological cases in a most scientific manner by means of psychotherapy, occupational therapy, recreational therapy and physiotherapy, including hyperpyrexia, insulin and metrazol treatments in special conditions.

ARTHUR J. SCHWENKENBERG, M.D.
Attending Neuropsychiatrist

ROBERT E. WINN, M.D.
Resident Physician

CONTENTS

Page

"PROGRESS IN NEUROSYPHILIS FROM A STATE-WIDE POINT OF VIEW"
Clifton T. Perkins, M.D., Boston, Massachusetts 261

"PRESENT-DAY TRENDS IN THE INVESTIGATION OF GENERAL PARESIS"
Harry C. Solomon, M.D., Boston, Massachusetts 262

"RESULTS OF ARTIFICIAL FEVER THERAPY IN SYPHILIS OF THE CENTRAL NERVOUS SYSTEM"
Walter E. Barton, M.D.; Embrie J. Borkovic, M.D.; Joseph M. Zucker, M.D., *and* Irene Malamud, M.A., Worcester, Mass. 264

"EVALUATION OF THE CLINICAL AND SEROLOGIC RESULTS IN THE TREATMENT OF GENERAL PARESIS BY MALARIA, MECHANO-THERAPY AND TRYPARSAMIDE"
Israel Kopp, M.D., Boston, Massachusetts 270

"FOLLOW-UP OF CASES OF DEMENTIA PARALYTICA REQUIRING INDEFINITE MENTAL HOSPITAL CARE"
Elvin V. Semrad, M.D.; Clementine C. McKeon, M.D., *and* William Corwin, M.D., Waltham, Massachusetts 274

"INTERPRETATIONS OF THE SPINAL FLUID IN NEUROSYPHILIS"
Augustus S. Rose, M.D., Boston, Massachusetts 280

"THE ELECTROENCEPHALOGRAM IN NEUROSYPHILIS"
Knox H. Finley, M.D.; Augustus S. Rose, M.D., *and* Harry C. Solomon, M.D., Boston, Mass. 283

"CONGENITAL SYPHILIS IN MENTAL DEFECTIVES"
Clemens E. Benda, M.D., and Henry T. Tadgell, M.D., Boston, Mass. 286

"THE RELATIVE EFFICACY OF VARIOUS METHODS OF TREATING GENERAL PARESIS"
William Freeman, M.D., Worcester, Massachusetts 302

"NEUROPATHOLOGIC FEATURES OF GENERAL PARESIS IN RELATION TO MENTAL DISTURBANCES"
D. Rothschild, M.D., and M. L. Sharp, M.D., Foxborough, Mass. 310

NEXT MONTH WE PRESENT:

PSYCHOSIS WITH HUNTINGTON'S CHOREA
Richard D. Kepner, M.D., Kaneohe, Oahu, T.H., *and* Ralph B. Cloward, M.D., Honolulu, T. H.

CLINICAL IMPLICATION OF PSYCHOSOMATIC MEDICINE
Louis A. Schwartz, M.D., Detroit, Michigan

ALCOHOL AND TRAFFIC ACCIDENTS
Donald S. Berry, Ph.D., Chicago, Illinois

TUBERCULOSIS IN DRUG ADDICTS
Murray A. Diamond, M.D., Lexington, Kentucky

SOME INFLUENCES OF CATHOLIC EDUCATION AND CREED UPON PSYCHOTIC REACTIONS
Walter O. Jahrreiss, M.D., Baltimore, Maryland

EVERY MONTH:

Informative articles on topics of current interest. Expositions of the latest developments in psychiatry and neurology.

To receive this valuable publication monthly see page 317 for Special Subscription Offer

CHESTNUT LODGE SANITARIUM

An institution for the application of Psychoanalytic Psychiatry to the Psychoses and Psychoneuroses.

DEXTER M. BULLARD, M.D.
Physician-in-charge
Rockville — Maryland

Tucker Hospital

212 West Franklin Street (Corner Madison)
RICHMOND, VIRGINIA

A private hospital for the study and treatment of Neuropsychiatric and Endocrinological Cases

Under the Charge of
Drs. Beverley R. Tucker, Howard R. Masters, and Jas. Asa Shield

THE HARDING SANITARIUM WORTHINGTON, OHIO

For Nervous and Mental Disorders

NINE MILES NORTH OF STATE HOUSE—COLUMBUS

GEORGE T. HARDING, M.D., *Medical Director*
HARRISON EVANS, M.D.
FRED H. WEBER, M.D.
MARY J. WEBER, M.D.

SAINT ALBANS SANATORIUM

RADFORD, VIRGINIA

For the diagnosis, care and treatment of Nervous and Mental Diseases and Alcoholism

For rates and further information, address
JAMES P. KING, M.D.

RAHM THERMO-CONTAX RECORDER*

The new method of graphic recording for ENCEPHALOGRAPHS and ELECTROCARDIOGRAPHS . . . Unique, *inkless* writing . . . Permanent, fade-proof records . . . Produces a line of fine resolution . . . entirely *non-fluid* . . . Non-sparking, smokeless . . . Smooth and trouble-free operation . . . Sturdy, steady stylii for sensitive recording.

RAHM INSTRUMENTS, Inc.
12 West Broadway, New York City
Consulting Engineers and Designers of Electro-Medical Equipment

RAHM ENCEPHALOGRAPH
RAHM CORTICAL STIMULATOR
RAHM ELECTRO-SHOCK MACHINE
RAHM SURGE CURRENT RECORDER

Write for Technical Bulletin No. 3

*Patent Applied For

The LIVERMORE SANITARIUM — Livermore, California

SAN FRANCISCO OFFICE—450 SUTTER STREET

FOR NERVOUS AND MENTAL DISEASES

Situated in a beautiful valley forty miles from San Francisco; two hours ride on the Southern Pacific Railroad. Elevation five hundred feet. Climate excellent with sunshine almost every day.

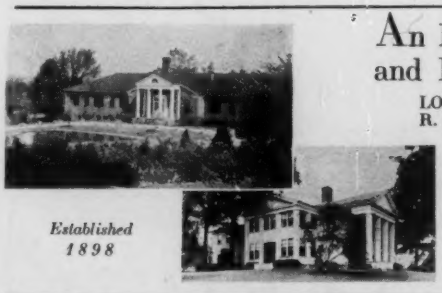
Large resident medical staff; Well trained nursing service; Clinical Laboratory; X-ray department; Hydrotherapy, Athletic and Occupational Departments. Dietary Department insures an excellent cuisine.

Separate Department for the functional neuroses. Cottage system for mental patients.

Several Bungalows for individual patients, wishing home-like surroundings with absolute privacy and the very best accommodations.

Booklet on request.

J. W. Robertson, M.D., Consulting — **Clifford W. Mack, M.D., Superintendent**



Established 1898

An Institution for the study and treatment of Nervous and Mental Disorders. Write for booklet.

LOUIS J. KARNOSH, M.D., *Consultant* — JOHN H. NICHOLS, M.D., *Medical Director*
R. R. GOULD, M.D., *Resident Physician* — HERBERT A. SIHLER, *Managing Director*

WINDSOR HOSPITAL

CHAGRIN FALLS, OHIO • Phone: Chagrin Falls 360
Member American Hospital Association and Central Neuropsychiatric Hospital Ass'n.

PASADENA SANITARIUM

(Founded 1906 by T. W. Bishop, M.D., 1870-1938)

INTELLIGENT AND UNDERSTANDING CARE FOR ALL TYPES OF NERVOUS AND MENTAL CASES.
SELECTED CASES OF ALCOHOLISM AND HABITUATION.

Located on a secluded 33 acre tract—Seven miles from downtown Los Angeles

G. H. REINHARDT, M.D.
Medical Director

T. W. BISHOP, JR.
Executive Director

— P. O. Box 111 — South Pasadena, California —

Rogers Memorial Sanitarium

OCONOMOWOC, WISCONSIN

Telephone 448

A PRIVATE sanitarium (incorporated not-for-profit)

for the treatment of

Diseases of the Nervous System

All approved methods of therapy are used

Resident Physicians

JAMES C. HASSALL, M.D., *Medical Director*
OWEN C. CLARK, M.D.
DONALD A. R. MORRISON, M.D.

SAINT JOSEPH SANITARIUM

(Supervision of Sisters of Mercy)

P. O. Box 236

Dubuque, Iowa

or phone 526 for information

Mild Mental and Nervous Cases

also

Rheumatism, High Blood Pressure, Neuritis, Obesity, and all Types of Convalescents

Modern Hydrotherapy, Baths and Massage

Insulin Therapy Resident Psychiatrist

MAIN BUILDING

FENWICK SANITARIUM

COVINGTON, LOUISIANA

Successfully Operating for Over Fifty Years

For the Treatment of

Nervous and Mild Mental Diseases - Drug and Liquor Addictions

1. **An ethical Institution for the care of Mild Mental and NERVOUS Disorders including Liquor and DRUG Addictions. Fifty years of continuous service.**
2. **Registered by the American Medical Association—a member of the American Hospital Association, National Association of Private Psychiatric Hospitals and Louisiana State Hospital Association.**
3. **Specially trained staff whose work is devoted entirely to Sanitarium patients. Each patient is an individual case.**
4. **A clinical laboratory in complete charge of two of the best Pathologists in New Orleans.**
5. **New buildings, brick, concrete and steel; individual rooms, steam heat, electric fans, Homelike surroundings. Attractive grounds.**
6. **Located in the beautiful, quiet and healthful town of Covington, Louisiana—a little over one hour and a half from New Orleans and Baton Rouge, Louisiana, by auto.**

DR. F. F. YOUNG, Medical Director.

VOL. III SEPTEMBER 1942 NO. 9

EDITORIAL OFFICES
UNIVERSITY OF TEXAS SCHOOL OF MEDICINE
800 AVENUE B., GALVESTON, TEXAS

BUSINESS OFFICES
PHYSICIANS POSTGRADUATE PRESS
500 NORTH DEARBORN ST., CHICAGO, ILLINOIS

COPYRIGHT, 1942 BY
PHYSICIANS POSTGRADUATE PRESS

DISEASES of the NERVOUS SYSTEM

(PUBLISHED MONTHLY)

A PRACTICAL JOURNAL ON PSYCHIATRY AND NEUROLOGY

EDITORIAL COMMENT

Progress in Neurosyphilis from a State-Wide Point of View

The problem of neurosyphilis has been of interest to physicians since earliest times, but it was not until the turn of the century that any great progress was evident in the treatment of this condition. Indeed, it is within the lifetime of most of us here today that the greatest strides have been made from the standpoint of therapy. As we look back to the time when the spirochete was isolated as the pathogenic organism of syphilis, we recall certain dates that have now become historical facts. In 1906, Wassermann, Neisser, and Bruck applied the Bordet-Gengou phenomenon of complement-fixation as a test for syphilis. Thus, the Wassermann reaction was born. In the same year, 1906, Hoffmann demonstrated that the treponema pallidum was present in the cerebrospinal fluid in the early stages of the disease. Two years later, in 1908, Plaut showed that spinal fluid could be used in place of blood serum for the Wassermann reaction, and Lange first used his gold-sol test. In 1912, Lange published material on the gold-sol reaction after four years of study. Noguchi and Moore, in 1913, found spirochetes in 14 out of a total of 70 cases, diagnosed as general paresis. The introduction of malarial therapy, as another tool in our toolbag of treatments, by Wagner von Jauregg in 1917, marked one of the greatest advances in the treatment of neurosyphilis. From 1917 to 1922, 400 cases were so treated. Of these, 33 per cent had complete and 14.25 per cent partial remissions. This marked the beginning of the "malarial treatment period." Before this time, treatment was chemotherapeutic, with the well known mercury, bismuth, arsenicals and iodine. Progress continued, slowly but surely, and in 1929, Neymann and Osborne introduced artificial fever therapy with high-frequency electrical currents. This marked the beginning of another era in the treatment of neurosyphilis, which might well be called the "artificial fever period." Thus, we may sum up, as was said before, during the lifetime of most of us present here today, we have seen the period of chemotherapy, that of malarial therapy, and lastly, the period of artificial fever therapy. In passing, it may be of interest to note that in making a state-wide statistical survey on general paresis, we find that our statistics on this condition have changed, as modes of therapy have been introduced. Whereas between the years 1921 to 1930, inclusive, we had a total of 2,392 admissions to our State Hospitals in Massachusetts, diagnosed as general paralysis, between the years 1931 to 1940, inclusive, we had a total of only 2,015 admissions. Readmissions, diagnosed as general paralysis, between 1921-1930, inclusive, numbered 417, while between 1931-1940, inclusive, readmissions numbered 405. Discharges of cases, diagnosed as general paresis, between 1921-1930, inclusive, totaled 544, and should be compared with the years 1931-1940, inclusive, during which the total was increased to 750 discharges. The number of deaths due to general paresis shows a remarkable change. Between the years 1921-1930, inclusive, there were 1,923 such deaths in our State institutions, but between 1931 and 1940, inclusive, there were only 1,140 deaths attributed to this condition. These figures will serve to give us encouragement to push ahead with the work in this field, and, since we are not drawing any conclusions at this time, will stimulate us to carry on with the principles upon which the Massachusetts Society for Research in Psychiatry was founded.

Clifton T. Perkins, M.D.

Commissioner Massachusetts Dept. of Mental Health, Boston, Mass.

Present-Day Trends in the Investigation of General Paresis

HARRY C. SOLOMON, M.D.
Boston, Massachusetts

Dr. Solomon graduated from Harvard Medical School in 1914. He was resident at Boston Psychopathic Hospital, 1914 to 1916, and today continues to be connected with this institution. He is Clinical Professor of Psychiatry, Harvard Medical School; Chief of Therapeutic Research, Boston Psychopathic Hospital; Visiting Neuropsychiatrist, Beth Israel Hospital; Associate Neurologist at Massachusetts General Hospital.

Our knowledge of general paresis and neurosyphilis is more complete than that of any other diagnostic category in psychiatry. Much is known of the etiology, pathology, clinical course, and therapeutic procedures. There are laboratory tests which are of great assistance, both in diagnosis and for the direction of treatment. But, the story of the disorders in the group of neurosyphilis is by no means a finished one. There still remain innumerable problems that await solution.

In introducing this symposium, it may not be out of place for me to make some discursive remarks about some problems which offer opportunity for investigation. Considering the matter of diagnosis, one finds that it is not possible in many cases seen clinically to make a clear-cut differentiation between the meningeal, vascular, and parenchymatous types of pathology in processes responsible for the psychosis. Further, there are many cases of asymptomatic neurosyphilis, in association with manic-depressive psychosis, dementia praecox, and the alcoholic psychoses, in which one is likely to be in error because there is no established method of correct interpretation. These suggest, what to my mind is one of the most intriguing problems of psychiatry, namely, the relationship between the organic process and the mental symptoms. The similarity of the pathologic or histologic picture in cases of general paresis is by no means paralleled by the clinical manifestations. Why one patient is depressed, another elated, and a third showing merely simple dementia, with a similar pathologic basis, is a matter, the solution of which is sorely needed and when found, will open the door to many of our psychiatric problems.

Do these differences in clinical manifestation stem from the localization of the process; do they depend on whether the organic changes are most marked far anteriorly in the frontal lobes or more in the base near the hypothalamus, further back in the frontal region, or temporal pole involvement? Do preponderately degenerative changes cause a different picture than one in which inflammatory and irritative processes are more pronounced? Several other similar possibilities will at once come to mind.

In regard to the spinal fluid changes, one would like to know if the Wassermann reacting bodies or the flocculation materials are developed in the central nervous system or filtered through from the blood stream. One would also like to know if there is any special significance to a weak blood serologic reaction as contrasted to a stronger one. Can we draw any conclusion concerning the findings of the cells? Has the number present, whether high or low, any significance, or does the variety of cell found afford any interpretation? From whence comes the protein? What is its significance? What can one conclude from the very high total protein as contrasted to one which is only very moderately increased? What causes the gold sol precipitation? In some cases of general paresis the ventricular fluid gives reactions similar to those found in fluid from the lumbar space. In others, the ventricular fluid is completely normal in every respect. Does this have any relationship to the extent of the process, to the outcome under treatment, or to the speed of development? Again, the answer awaits somebody's work toward its solution.

Great advance has been made in the treatment of paresis both by fever and the pentavalent arsenical tryparsamide. Nevertheless, there are many points on which we need enlightenment. First and foremost, when it comes to the use of fever as a therapeutic agent, what is the optimum temperature for successful therapy? How high should the temperature be carried? How long should it be maintained? How many times repeated?

What is the most therapeutically successful type of fever—that produced by a disease processes such as malaria, (and there are probably other febrile diseases that may be more valuable), by vaccines, or mechanically created hyperthermia? What is the mode of action of fever? Is it purely the effect of temperature on the spirochete or is there a process of immunity that plays a role? Is the intraventricular or intracerebral inoculation of malaria, as suggested by the French authors, a better method than by the intravenous route?

Similarly, when one considers drug therapy in the form of tryparsamide, one finds that there is little evidence as to what is the best dosage. It has been conventional to give the average individual 3 grams of the drug at weekly intervals. This does not imply it to be the best system, but nowhere in the literature is there any evidence of study concerning this point. Is there any value of a continuous drip method of giving tryparsamide? Is it more effective when used at the same time that fever is being experienced by the patient? How much increased value can be obtained by the simultaneous use of trivalent arsenicals such as arsphenamine and mapharsen? Is it possible that massive doses of these drugs, such as now are being used in early syphilis, will prove a successful method of therapy? Do some of the vitamines such as B complex, or more specifically, nicotinic acid, have any effect upon the psychotic states? Before the introduction of fever methods and tryparsamide, some very good results in the treatment of general paresis were obtained by the intraventricular injection of arsphenaminized serum. Would a continuation of this form of treatment, in conjunction with tryparsamide and fever, bring better results than are now obtained?

Certainly one need not be satisfied with our present spirocheticidal drugs. Pharmacologic investigations are needed and we can expect the development of new medicaments. While the superiority of tryparsamide over the trivalent arsenicals in the treatment of central nervous system syphilis has been established, no one has yet offered a reasonable explanation of this differential value. This is especially significant when it is realized that tryparsamide has a lesser spirochetecidal effectiveness than have the trivalent arsenicals. Nor is there a ready answer as to how long it is necessary or wise to continue treatment. Should one strive to obtain a normal spinal fluid, or can one be satisfied with some arbitrary time limit of treatment?

There are many biologic problems requiring study. The old perennial question as to why some syphilitics develop central nervous system syphilis and others escape this manifestation confronts us; and the further query as to why in some instances the spinal cord is involved and in others the cerebrum, while in some instances the meninges take the brunt of the attack, and in others the blood vessels are chiefly involved. It is well known that if the central nervous system is involved by the spirochete, the general bodily viscera are likely to escape. This is more frequently the case when it is of the paretic than of the tabetic type. There is suggestive evidence that pregnancy acts as a protective influence to the central nervous system in cases of syphilis. This needs further documentation. What effect has central nervous system syphilis on the fertility of woman?

It is a matter of general experience that hallucinations are extremely infrequent in cases of paretic neurosyphilis, but following malaria treatment, the frequency of hallucinatory manifestations is greatly increased. If one could find out why this is so, one would add enormously to the knowledge of the mechanism of psycho-pathologic manifestations.

Electro-encephalography has added a new tool for the study of neurosyphilis. How far will this offer us a method of evaluating damage to the brain or the localization of the pathologic process, aid in the prognosis, or form a guide as to the effectiveness of treatment?

The foregoing remarks would seem to indicate that the subject of neurosyphilis still offers the opportunity for additions to our knowledge, and the titles of the papers to be presented is evidence that our Massachusetts psychiatrists are not only aware of this, but have attacked a number of the problems with both energy and ingenuity.

Results of Artificial Fever Therapy in Syphilis of the Central Nervous System*

(Follow-up of 268 Cases Treated Since 1930)

WALTER E. BARTON, M.D.; EMBRIE J. BORKOVIC, M.D.;
JOSEPH M. ZUCKER, M.D., *and* IRENE MALAMUD, M.A.**
Worcester, Massachusetts

Dr. Barton is presently Assistant Superintendent of Worcester (Mass.) State Hospital. He holds degrees of B.S. and M.D. from University of Illinois. After a rotating internship at West Suburban Hospital in Oak Park, Illinois, he went to Worcester State Hospital where he has served in various capacities to the present time. His neurological training was secured at the National Hospital, Queen's Square, London. Dr. Barton is on the faculty of Smith College School for Social Work as lecturer in medicine and in social psychiatry and also lectures at Clark University. Dr. Barton is a Diplomate of the American Board of Neurology and Psychiatry; Fellow of the American Psychiatric Association. He is President of the Massachusetts Association for Occupational Therapy.

Dr. Borkovic is in charge of the Medical and Surgical Division of the Worcester State Hospital. He is a graduate of the University of Pittsburgh and of Boston University, School of Medicine. He served a two-year internship at the Boston City Hospital. He has been on the staff of the Worcester State Hospital for the last eight years.

Dr. Zucker is Senior Psychiatrist at Worcester State Hospital. He received his M.D. in 1936 at Johns Hopkins University. Interned in Montreal for a year, then was Clinical Clerk and did post-graduate work in Neurology at the National Hospital in London. He was a Fellow in Neuropathology for two years at the Mount Sinai Hospital, New York City. At Worcester State Hospital for two years, beginning as Clinical Assistant. He has collaborated in neuropathological reports, chiefly dealing with brain tumors; has taught Neuroanatomy and Neuropathology at intervals for the past three years; at present is also teaching in psychiatry.

Irene Malamud is a graduate of the University of Washington (Seattle) in 1926 with an A.B. degree. She served as assistant to the head social worker at the Foxborough State Hospital, 1926-27. Received her M.A. in Sociology at the University of Iowa in 1938. At present Mrs. Malamud is instructor in Sociology at the Worcester State Hospital and is social worker in the Psychosomatic Clinic of the Worcester City Hospital. Mrs. Malamud has assisted in the social investigation of several research projects.

Artificial fever treatment of central nervous system syphilis was introduced at the Worcester State Hospital by Perkins[1] shortly after its description by Neymann and Osborne[2] in 1929. This therapy has been given to patients from 1930 to 1941. The number was sufficiently large, it was felt, to be representative of the clinical material available in State hospitals.

Few studies trace any considerable number of cases for many years. Those of O'Leary,[3] Ewalt and Ebaugh,[4] Bennett,[5] Solomon and Epstein,[6] and Neymann[7] are worthy of note as follow-up observations. Comparatively few cases have been followed more than five years.

In the early days of fever treatment, when high frequency currents were derived from spark gap apparatus, it was customary to use lower temperatures over shorter periods than is the general practice today. The method was somewhat cumbersome, but required fewer hours of supervision of the patient. The hazard of burns was considerable because of the rather crude electrodes then in use, together with the tendency of damped waves to dissolve fat. With refinements in the physical equipment and a better estimation of the tolerance of the patient, resulting from experience, it became possible to increase the height of the fever as well as the duration of treatment. The electromagnetic induction cabinet, now in use, provides greater comfort to the patient through humidified air conditioning and freedom of movement. More penetrating heat and less heating of the skin occurs.

Since 1930, the form of the treatment has also been changed several times in accordance with prevailing theories. Temperatures were raised and the time increased in the hope that the spirochetes might be attenuated or destroyed. The experiments of Bessemans[8] and others[9] point to the non-specific effect of all forms of fever in central nervous system syphilis and would seem to indicate that any safe temperatures used are not capable of killing the *Treponema pallidum* in human tissue except in the initial or surface lesions. The death of the spirochete is probably not the actual achievement of the treatment.

Cases have been grouped for the purpose of this study according to the variations in treatment that have been made.

It seemed important to note whether the simpler, less time consuming practice of elevating the temperature to 105 F. and then letting it fall was associated with the same

---

*Presented at The Massachusetts Society for Research in Psychiatry held on October 10, 1941, Foxboro (Mass.) State Hospital.

**From the Staff of the Worcester State Hospital.

GROUP CLASSIFICATION

Group I. Temperature brought to 105° F. and not held more than 3 hours total time above this point.

Group II. Temperature brought to 106° F. and not held more than 20 hours above 105° F.

Group III. Temperature brought to 106° F. and held more than 20 hours total time above 105° F.

Group IV. Temperature brought to 106° F. with 10 or more hours of fever treatment above 106° F.

final results as those obtained in the prolonged high fevers in common use today. The aim at present is to discuss only the social and economic adjustment of patients treated with different fever technics after a lapse of years. Other equally interesting aspects of comparative and correlative results will be demonstrated in another report.

Procedure

All cases of central nervous system syphilis with diathermy records since 1930 are included in this study. Case records of the patients were examined and statistics compiled from the detailed fever charts. Information concerning individuals outside of the hospital was obtained by letter, questionnaire and personal visit, or from records of other hospitals, clinics or private physicians. Some patients were seen at the hospital; others were interviewed in their homes. Some persons were "lost." There were others who had temporarily dropped from view for an interval in the decade covered in this survey and, finally, there were some with whom personal interviews and evaluation were not possible.

An individual was considered recovered if he were engaged in an occupation at least equal to that which he had held prior to the onset of illness and if he had made an adequate social adjustment. Other cases out of the hospital were listed as improved. An open ward placement indicated a satisfactory hospital adjustment. (Occasionally a patient remained in the institution owing to lack of adequate visit resources.) "Closed ward" residence in the hospital was grouped as a unit and included the unimproved as well as the deteriorated individuals.

Clinical Results

Table I gives a general description of the total sample and of the four fever groups. Group 1 was the largest with 168 cases. Next came Group 3 with 57, then Group 2 with 28 and, finally, Group 4 with 15. The mean of the admission age for the total sample was 40.7 years, ranging from 11 years (in juvenile paresis) to 61 years. Men outnumbered women about 4 to 1. Few of the patients were colored (6.7%). The mean of the duration of infection before hospitalization was 15.8 years and ranged from 3 to 45 years. The mean of the duration of symptoms before hospitalization was 22.7 months, ranging from 0 (no symptoms or sudden onset) to 14 years. (Juvenile paresis was excluded from this consideration.)

Only 3.4 per cent were without psychosis. There were seven juvenile paretics and one case of unclassified psychosis. The mean pe-

TABLE I

GENERAL CHARACTERISTICS OF 268 FEVER-TREATED CASES WITH CLASSIFICATION INTO GROUPS

	No. of Cases	Age		Sex (%)		Color (%)		Duration of Infection (Years)		Onset of Mental Symptoms* (Months)	
		Mean	Range	Male	Female	White	Black	Mean	Range	Mean	Range
Group I.	168	41.1	11-61	76.8	23.2	91.7	8.3	15.9	4-40	23.4	0-156
Group II.	28	40.0	15-60.	64.2	35.8	92.9	7.1	18.2	3-45	29.7	1-120
Group III.	57	39.8	22-56	82.5	17.5	96.5	3.5	14.1	3-31	16.8	0-60
Group IV.	15	40.1	30-55	86.7	13.3	100.0	—	16.0	6-30	23.8	1-96
Total	268	40.7	11-61	77.2%	22.8%	93.3%	6.7%	15.8	3-45	22.7	0-156

*Juvenile paretics not included.

riod of elapsed time in the hospital before diathermy treatment was 5.4 months. Some of our early cases had been in the hospital more than 11 years before receiving this treatment.

In Table II the outcome of all cases is grouped as of July, 1941. Group 1 shows a striking mortality rate of 42.9 per cent. In Group 3, 12.3 per cent died. In comparing these figures, allowance must be made for the longer post treatment time lapse in Group 1 (the chronologically earlier group) as well as for the natural aging process.

TABLE II

OUTCOME IN PER CENT, AS OF JULY, 1941, OF ALL CASES TREATED WITH ARTIFICIAL FEVER SINCE 1930, BY GROUPINGS

Group	*Number*	*Dead*	*Closed Ward*	*Parole*	*Out of Hospital But not Recovered*	*Complete Restoration to Former Status*
		(5)	(4)	(3)	(2)	(1)
			(1?)	(3?)	(6?)	(7?)
I.	168	42.9	22.6	7.7	11.9	13.7
		(72)	(38)	(13)	(20)	(23)
II.	28	17.9	32.1	21.4	10.7	17.9
		(5)	(9)	(6)	(3)	(5)
						(1?)
III.	57	12.3	38.6	14.0	10.5	24.6
		(7)	(22)	(8)	(6)	(14)
IV.	15	33.3	33.3	20.0	6.7	6.7
		(5)	(5)	(3)	(1)	(1)
Totals	268	33.2	27.6	11.2	11.2	16.0
		(89)	(74)	(30)	(30)	(43)

Note: Figures in parenthesis refer to absolute numbers.

? indicates cases on whom data not available as of July, 1941.

In Group 3 35 per cent of the cases are out of the hospital, improved or recovered. More than another third are still in the hospital, with the majority of these on "closed wards." Only 10 per cent of the patients are on "open wards." The 35 per cent of the patients in Group 3 out of the hospital may be compared with 25.6 per cent enjoying the same status as in Group 1. In the total sample 27.2 per cent are out of the hospital at this date. Group 4 gave less favorable results.

Charts I, II, III and IV demonstrate the outcome according to the four types of fever treatment. It now becomes possible to compare the results of treatment after a number of years. (Correction has been made for cases that temporarily dropped from view and also for those in which early observations were shortened by the fact that they began treatments at a later date.)

Group 4 shows a higher initial death rate at the end of three months and Group 3 the lowest. In Group 1, 30 per cent have died in the third year as compared with 8.7 per cent in Group 3. Results are less satisfactory in Group 4; more patients are dead and relatively more still remain on "closed wards" within the hospital. (These figures cannot be weighted because of the few cases in the group). At the end of three years 30.4 per cent of Group 3 and 27 per cent of Group 1 are now out of the hospital. After the fifth year, Group 1 has 21.3 per cent of its patients out of the hospital and Group 3 16.7 per cent.

In order further to compare Group 1 and 3, the average time it took to effect a recovery in cases followed for six years was computed. In Group 3 this was 2.4 years and in Group 1 2.95 years, figures that are closely comparable.

Comments

There are numerous factors which must be considered in the evaluation of these results. One half of the cases had chemotherapy at some period after the initial infection and before admission to this hospital. Nineteen per cent of all our cases had had some form of fever therapy before admission. (This included, malaria, diathermy, radiothermy, and typhoid inoculations.) Thirty-one per cent had no previous treatment; 41.8 per cent of the patients originally admitted had had a previous admission to other hospitals and seven-eighths of these had passed through the Boston Psychopathic Hospital. (Consideration must be given to the fact that selected cases of general paresis were often retained at the Boston Psychopathic Hospital for the purpose of study. Usually the more hopeless cases or those that responded poorly to treatment were sent to the State hospital.)

When a patient was admitted he was placed on chemotherapy. Thus all cases received drugs often before, but surely during and after fever therapy while in the hospital resi-

OUTCOME IN 168 CASES OF C.N.S. SYPHILIS TREATED WITH ARTIFICIAL FEVER WHERE TEMPERATURE WAS BROUGHT TO 105° AND NOT HELD MORE THAN 3 HOURS TOTAL TIME ABOVE THIS POINT (GROUP I)

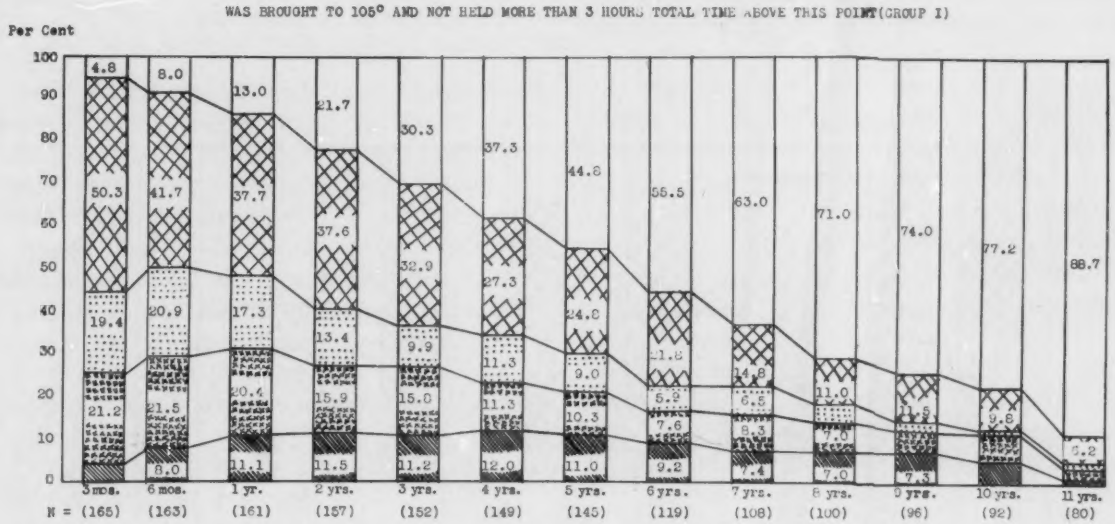


CHART I

OUTCOME IN 28 CASES OF C.N.S. SYPHILIS TREATED WITH ARTIFICIAL FEVER WHERE TEMPERATURE WAS BROUGHT TO 106° AND NOT HELD MORE THAN 20 HOURS ABOVE 105°. (GROUP II)

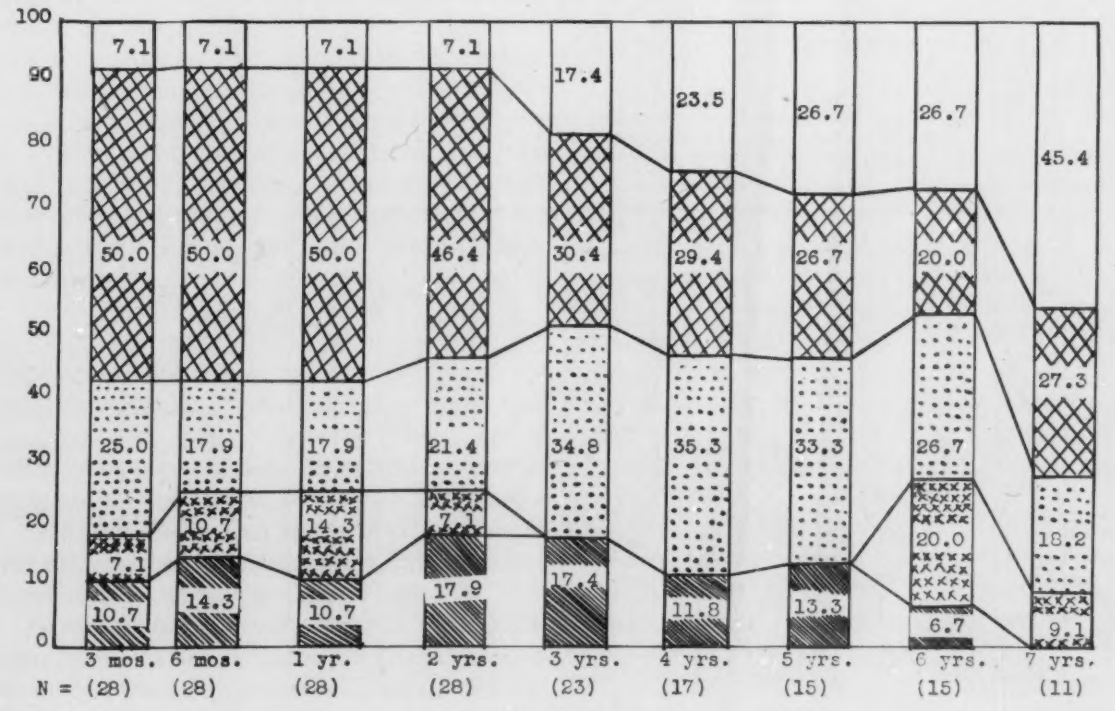


CHART II

OUTCOME IN 57 CASES OF C.N.S. SYPHILIS TREATED WITH ARTIFICIAL FEVER WHERE TEMPERATURE WAS BROUGHT TO 106° AND HELD MORE THAN 20 HOURS ABOVE 105° (GROUP III)

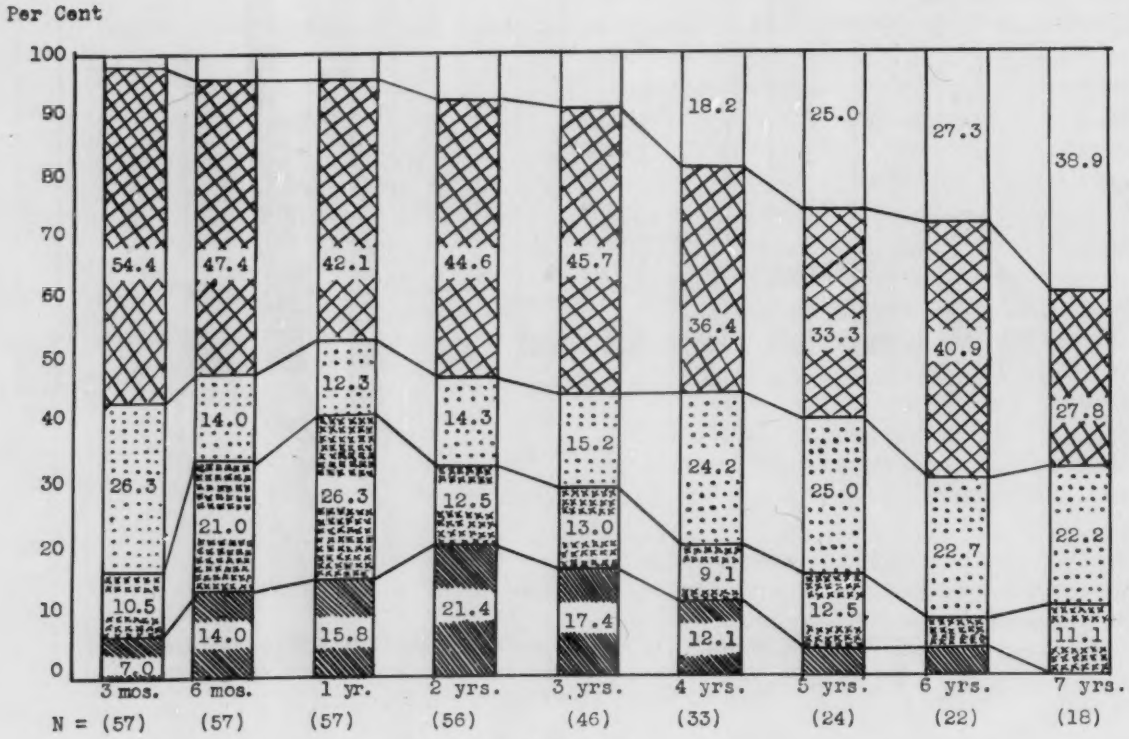


CHART III

OUTCOME IN 15 CASES OF C.N.S. SYPHILIS TREATED WITH ARTIFICIAL FEVER WHERE TEMPERATURE WAS BROUGHT TO 106° WITH 10 OR MORE HOURS OF FEVER TREATMENT ABOVE 106°. (GROUP IV)

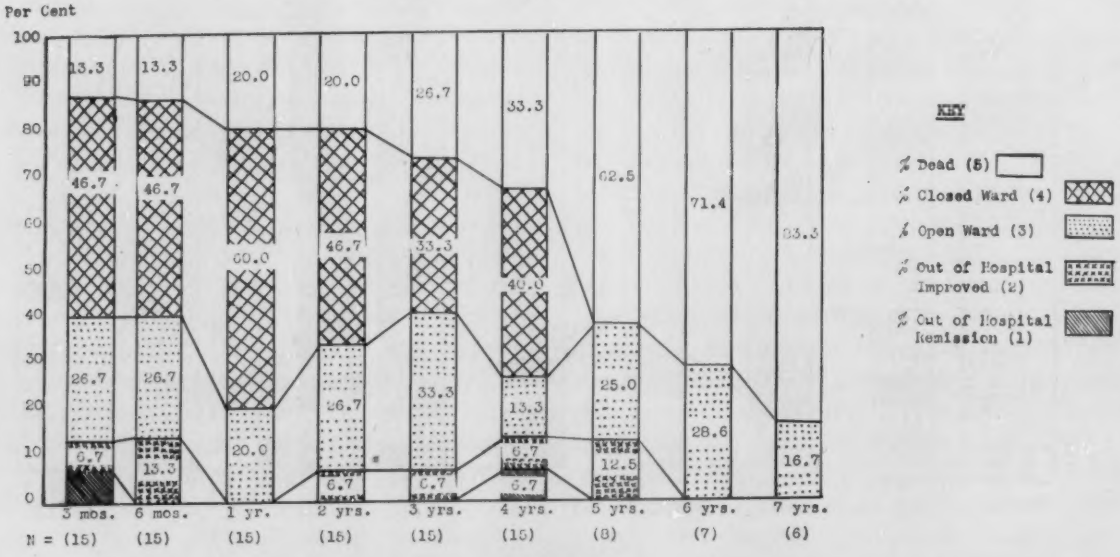


CHART IV

dence. Most patients continued it after leaving.

Procedure Now in Use

Electromagnetic induction in humidified cabinet with *fever* brought to 106 F. for 4 hours for 7 periods given not more often than every other day. Course repeated after six months if necessary.

Tryparsamide—3 grams intravenously at weekly intervals for 4 months.

Bismuth subsalicylate in oil—.13 grams intramuscularly at weekly intervals for 3 months.

Mapharsen—.06 grams intravenously weekly for 3 months.

These drugs are repeated in *continuous* rotation without rest period.

Blood and spinal fluid examinations are made every 6 months.

In 29.1 per cent of all cases fever treatment was given more than once. This included 16.1 per cent of Group 1, 42.9 per cent of Group 2, 52.6 per cent of Group 3, and 60 per cent of Group 4. (The type of repeat treatment was usually artificial fever but a few received malaria and a still smaller number typhoid inoculations.)

Complete data are not available on all cases. In the follow-up it was learned that not all patients had been seen at regular intervals. Many had been referred to family physicians and the records were incomplete, some dropped from sight for a time. We have made allowance for many of the errors. They are often nullified in comparisons of group with group because the same error is constant in all.

Summary

1) Some of the results of the study of 268 cases of syphilis of the central nervous system, treated with diathermy from 1930 to 1941, have been presented. Certain general statistical conclusions have been indicated.

2) Subgrouping was made on the basis of variations in the height and duration of the temperature elevation.

3) Emphasis has been placed on these variations and on the outcome for the patient in terms of subsequent economic and social function.

4) Statistical methods have been used for purpose of evaluation. Sources of error are indicated and allowance is made for some. These are often nullified by being constant in all groups.

5) The treatment method now in use (Group 3) has the highest survival rate throughout the entire five-year period, but the highest percentage in hospital residence; its recovery rate is highest three years after treatment. After five years its recovery rate is roughly comparable, though apparently slightly below that obtained with less intense fever therapy (Group 1).

6) The comparatively good results with shorter periods of fever as in the initial method would tend to point toward a nonspecific effect of fever as a therapeutic agent.

7) The average time of recovery in cases followed for six years in the present method (Group 3) is 2.4 years as compared with 2.95 years with less intense fever treatment (Group 1).

8) The treatment of choice would therefore seem to be that which elevates temperature to 106 F. and holds it during the several fever periods more than 20 hours above 105° F. because of: (a) the better chance for survival at any point in the five-year period, and (b) the maintained high (usually highest) recovery rate.

References

1 Perkins, C. T.: "Diathermy Treatment of Dementia Paralytica: A Preliminary Report," *Am. Med.*, 37: 546-22 (Sept.) 1931.

2 Neymann, C. A., and Osborne, S. L.: "Artificial Fever Produced by High Frequency Currents: Preliminary Report," *Illinois M. J.*, 56: 199-203 (Sept.) 1929.

3 O'Leary, P. A.; Bruetsch, W. L.; Ebaugh, F. G.; Simpson, W. M.; Solomon, H. C.; Warren, S. L.; Vonderlehr, R. A.; Usilton, Lida J., and Sollins, I. V.: "Malaria and Artificial Fever in the Treatment of Paresis," *J.A.M.A.*, 115: 677-681 (Aug. 31) 1940.

4 Ewalt, J. R., and Ebaugh, F. G.: "Treatment of Dementia Paralytica: A Five-Year Comparative Study of Artificial Fever Therapy and Therapeutic Malaria in Two Hundred and Thirty-Two Cases," *J. A. M. A.*, 116: 2474-2477 (May 31) 1941.

5 Bennett, A. G.; Nielsen, J. C.; Fechner, A. H., and Cash, P. T.: "Combined Artificial Fever and Chemotherapy in Dementia Paralytica: Preliminary Report of 70 Cases," *Arch. Phys. Therapy*, 20: 620-627 (Oct.) 1939.

6 Solomon, H. C., and Epstein, S. H.: "Dementia Paralytica: Results of Treatment with Malaria in Association with Other Forms of Therapy," *Arch. Neurol. and Psychiat.*, 33: 1008-1021 (May) 1935.

7 Neymann, C. A.: *Artificial Fever*, p. 129, C. C. Thomas, Springfield, 1938.

Neymann, C. A.: "The Treatment of Syphilis with Artificial Fever," *Am. J. Syph., Gonor. and Ven. Dis.*, 22: 92-116 (Jan.) 1938.

8 Bessemans, A.: "New Experimental Data on Artificial Hyperthermia," *Ann. Int. Med.*, 11: 1933-1945 (May) 1938.

9 Reiman, H. A.: "The Significance of Fever and Blood Protein Changes in Regard to Defense Against Infection," *Ann. Int. Med.*, 6: 362-374 (Sept.) 1932.

Shamberg, J. F., and Rule, A. M.: "Studies on the Therapeutic Effect of Fever in Experimental Rabbit Syphilis: The Thermal Death Point of Spirochaeta pallida," *Arch. Dermat. and Syph.*, 14: 243-255, 1926.

Evaluation of the Clinical and Serologic Results in the Treatment of General Paresis by Malaria, Mechano-Therapy and Tryparsamide*

ISRAEL KOPP, M.D.
Boston, Massachusetts

Dr. Kopp graduated from Tufts Medical College, 1927. Following four years of internship, became a Research Associate in the Massachusetts Department of Mental Health in the Neurosyphilis Clinic of the Boston Psychopathic Hospital. His work has been especially concerned with the pathologic physiology of therapeutic fever and chemotherapy of syphilis. On active duty with U. S. Army.

The beneficial effects of malaria, artificial fever and tryparsamide in the treatment of general paresis are now well recognized. Differences of opinion still exist, however, as to the superiority of one type of therapy over the other. We wish to report in this communication the clinical and serologic results obtained at the Boston Psychopathic Hospital in the treatment of general paresis by these three different methods.

Methods—Tryparsamide has been in use since 1923, malaria inoculation since 1925 and artificial fever since 1930. Artificial fever has been induced by various methods: (a) diathermy, (b) hot moist air, (c) radiant lamps, and (d) inductothermy.

The usual procedure in malaria treatment is to allow from ten to fifteen paroxysms, but in some instances less than ten and as many as twenty paroxysms were experienced. When fever was induced by mechanical means a course consisted of ten to fifteen temperature elevations. When the hypertherm was used treatment was usually given once a week; with diathermy and radiant lamps two or three times a week. Some patients have received more than one course of artificial fever or malaria. Treatment with tryparsamide alone consisted in most instances of weekly injections of tryparsamide until serologic reversal occurred.

Three main plans of treatment were followed when artificial fever was given: (a) Body temperature was raised to levels of 104-106 F. and then immediately allowed to fall, (b) and (c) body temperature was raised to levels of 105-106.4 F. and prolonged for a total of approximately 25 to 50 hours, usually two or five hours at each treatment.

Fever was followed in most patients by prolonged chemotherapy, usually by weekly injections of tryparsamide. Many patients had also received chemotherapy consisting of trivalent or pentavalent arsenicals prior to the administration of fever.

It should be stressed that the material for each type of therapy was somewhat selective. Patients receiving tryparsamide therapy alone showed usually mild parenchymatous involvement and did not require hospitalization. The more active and unmanageable patient was ordinarily hospitalized and given malaria therapy. Patients with complicating diseases involving the heart, lungs, kidneys and liver or with hypertension were most often given artificial fever.

Results—Of the three methods of therapy the clinical results obtained with tryparsamide were somewhat superior to those of malaria and especially to those of artificial fever (Table 1). This may well be attributable to the milder type of paresis in this group. A group of seventeen patients treated with tryparsamide were subsequently given fever (to fifteen patients malaria; to one typhoid vaccine and to one patient rat bite fever) be-

* From the Boston Psychopathic Hospital.

TABLE 1

CLINICAL STATUS OF PARETIC PATIENTS FOLLOWING DIFFERENT MODES OF THERAPY AT THE BOSTON PSYCOPATHIC HOSPITAL

Therapy	*Malaria*	*Mechano-Therapy*	*Tryparsamide*
Number of Patients	173	118	81
Observation	3-9 yrs.	¼-7 yrs.	3-15 yrs.
Arrested	48.5%	7.9%	42.0%
Improved	15.2%	40.7%	29.6%
Unimproved or Worse	13.8%	34.6%	11.1%
Death (All deaths))	22.5%	16.8%	17.3%
Due to General Paresis)	14.5%	8.5%	6.2%
Due to Treatment)	2.3%	2.5%	0

cause of only slight or no clinical improvement. As a result of fever sixteen patients were clinically improved; in twelve the spinal fluid became normal and in four patients was moderately or greatly improved. These excellent clinical and serologic results have suggested that the treatment of choice for paresis is a combination of fever preceded and followed by tryparsamide. When the mental symptoms are minimal tryparsamide may be administered over a period of six to twelve months and if the clinical condition and spinal fluid show no improvement or progress, fever should then be given. Following fever therapy tryparsamide should be continued until a negative spinal fluid reaction results. When mental symptoms are severe, immediate fever therapy is advised. Mechano-therapy, though somewhat less successful in our hands in the treatment of paresis, is especially indicated when complicating factors prevent the use of malaria. It has been applied to debilitated patients and when cirrhosis of the liver, bladder disturbances, hypertension, syphilitic heart disease and diabetes have been present. A great advantage to many patients is that hospitalization is not necessary.

The clinical results obtained with artificial fever at the Boston Psychopathic Hospital have not equaled those reported by other clinics. Clinical improvement has been reported in as many as 90 per cent of patients, but these have consisted of only small groups. The reason for these wide discrepancies in clinical results among various clinics may well be the difficulties in diagnosis and the evaluation of the degree of improvement in the paretic patient. On the other hand, our clinical results with malarial therapy do not differ much from those obtained by others. The mortality rate caused by fever therapy *per se* at the Boston Psychopathic Hospital is about the same for each group of patients treated with malaria or artificial fever (Table 1). Continued use of artificial fever has further reduced the mortality rate to less than one per cent. The total mortality rate for each type of therapy, regardless of cause, is approximately the same.

The incidence and rapidity with which clinical remission occurs in general paresis depends upon the degree of parenchymatous involvement prior to therapy. The age of the patient is not of importance, but the duration of the psychosis is. When clinical improvement is to occur it ordinarily becomes evident during the first year of therapy. About 90 per cent of all clinical remissions following fever therapy (any type) occur by the end of the third year. Relapse, about 6 per cent in artificial fever and 3 per cent in malaria, is most apt to occur within three years after clinical remission and usually in the more severe type of paresis.

It is an established fact that the clinical changes in the paretic patient following fever therapy do not parallel those in the spinal fluid. However, the development of a normal fluid in our opinion is indicative of the arrest of the paretic process and should be the ultimate aim of all therapy. This belief is supported by the fact that a negative spinal fluid reaction is accompanied in 60 per cent of the cases by a remission and a positive spinal fluid test by only 42 per cent of remissions. The final clinical status of the paretic patient on the other hand, will depend on the extent of the parenchymatous damage prior to fever therapy. Thus fever and chemotherapy may produce a normal spinal fluid, yet the patient may remain unimproved or even become worse.

The serologic changes occurring as a result of the different types of therapy are seen in Table 2. The superiority of malaria and tryparsamide is evident, but it must be stressed that the periods of observation in these groups were much longer. The degree of spinal fluid

TABLE 2

SPINAL FLUID FINDINGS IN GENERAL PARESIS FOLLOWING VARIOUS TYPES OF THERAPY AT THE BOSTON PSYCHOPATHIC HOSPITAL

	Observation	Number of Patients	Normal	Greatly Improved	Moderately Improved	Unimproved
Malaria*	3- 9 years	169	36.7%	20.7%	18.3%	24.3%
Artificial Fever*	3- 6 years**	42	23.8%	42.9%	16.7%	16.6%
Tryparsamide	3-15 years	63	29.6%	15.9%	11.1%	44.4%

*Chemotherapy—Tryparsamide and trivalent arsenicals.
**One patient 7 years, 8 years and 10 years.

Code for Spinal Fluids:
Normal=cells 5 or less—globulin negative—total protein 40 mg. or less—negative gol sol—Wassermann negative in 1 cc.
Greatly Improved=Reactions very weak approaching but not quite negative.
Moderately Improved=Reasonable reduction from original strongly negative formula.

changes prior to fever influences the percentage of reversals. The effect upon the spinal fluid of chemotherapy subsequent to fever as seen in Table 3 is a strong argument for continued chemotherapy. Chemotherapy not only results in a higher percentage of spinal fluid reversals but helps in maintaining these reversals. The cooperative statistics reveal that when fever was not re-enforced by chemotherapy about 42 per cent of all spinal fluid reversals relapsed in contrast to only 24 per cent when chemotherapy was given. Two thirds of the spinal fluid relapses in the patients treated with fever, malaria or artificial, with or without subsequent chemotherapy, occurred within one year after reversal to negative.

TABLE 3

Post therapy status of originally positive spinal fluids and bloods after three years of treatment observation in paretic patients treated with fever only and with fever plus chemotherapy. (Cooperative Clinics.)

	No. of Patients	Spinal Fluid % Negative	No. of Patients	Blood % Negative
Malaria	8	5.8%	22	15.9%
Artificial Fever Only	3	11.1%	5	13.5%
Total Fever Only		6.7%		15.4%
Malaria Plus Chemotherapy	79	29.6%	60	30.6%
Artificial Fever Plus Chemotherapy	14	14.3%	12	13.6%
Total Fever Plus Chemotherapy		25.5%		25.4%

As has already been shown by many observers, the number of negative spinal fluid findings increases with time with each type of therapy (Table 4). It was observed, however, that a normal spinal fluid was obtained more rapidly when malaria was used and that the reversal rate for malaria was twice as great during the first four years after treatment than with artificial fever when both types of fever were re-enforced by chemotherapy.

TABLE 4

Average rates* of reversal of originally positive spinal fluids and bloods in treated paretics by methods of therapy and during four years of treatment observation. (Cooperative Clinics.)

Year of Treatment Observation	Malaria Sp. Fl.	Malaria Blood	Mechano Fever Sp. Fl.	Mechano Fever Blood	Both Sp. Fl.	Both Blood
First	5.4	5.9	2.1	5.3	3.7	5.6
Second	10.5	13.1	5.1	7.9	7.8	10.5
Third	18.9	19.5	9.2	11.3	14.1	15.4
Fourth	26.5	23.3	15.4	14.3	20.9	18.8

*Percentages cumulated by years of treatment observation.

It has been difficult for many workers to agree on an optimum amount of fever for paretic patients. A survey of the amount experienced by patients who had received malarial fever at the Boston Psychopathic Hospital resulted in the following conclusions:

1) In most instances the amount of fever experienced was no more than ten hours above 106 F., twenty hours above 105, or thirty hours above 104 F. (p. o.)

2) The total amount of fever above 100 F.

varied widely, even for the same number of paroxysms.

3) The amount of fever at temperature levels of 104, 105, or 106 F. and above did not make any significant statistical difference in the clinical results obtained.

4) Best clinical results were obtained when more than 150 hours of fever above 100 F. and from ten to fourteen paroxysms were experienced. Divided into temperature levels those patients did best who experienced from twenty to thirty-nine hours above 104 F. (p. o.) and who had sustained maximum temperature levels between 104 and 104.9 F.

These conclusions are at variance with those of other workers who have felt that better clinical results were obtained with an increasing number of paroxysms, a greater amount of fever and higher body temperature.

The conclusions of the cooperative clinics on the artificial fever treatment of general paresis are that most satisfactory clinical results were observed in patients with peak sustained temperatures* of 106 F. or above treated with a total amount of fever ranging from forty-three to fifty-six hours, of which at least 70 per cent, i.e., thirty to thirty-nine hours, was at temperature levels above 105 F. This does not differ much from our findings in patients treated with malaria. It has been whenever possible by the administration of tryparsamide.

4) The serologic results following malarial our impression, however, that patients who have been given a rapid rise and fall in temperature have done as well and probably better than those in whom body temperature was prolonged from twenty to fifty hours. We have selected for the time being a middle course and advise now a series of twelve to fifteen treatments consisting of a total of twenty to thirty hours of fever at 105-106 F.

Conclusions

1) The treatment of choice in general paresis is a combination of fever and tryparsamide, administered as early as possible.

2) The clinical results obtained with malaria are superior to those of artificial fever when both are followed by prolonged chemotherapy.

3) Clinical and serologic results are enhanced when fever treatment is preceded fever are superior during the first few years to those following artificial fever when each is re-enforced by chemotherapy. With time the serologic results of each are about equal.

5) We are not as yet convinced that prolonged artificial fever results in a better clinical or serologic response than the rapid "up and down" method.

* The highest temperature recorded as having been sustained for at least one hour throughout the entire course of the fever therapy.

Note.—The author acknowledges the generous use of the statistics of the Cooperative Clinics, of which the Boston Psychopathic Hospital is a contributing member.

Announcement of Fellowships in Medicine and Public Health

Offered by the Commonwealth Fund of New York through the Pan American Sanitary Bureau

The Commonwealth Fund of New York, a philanthropic foundation established in 1918 by the late Mrs. Stephen V. Harkness, announces that it is offering through the Pan American Sanitary Bureau fifteen fellowships for one year's study of public health subjects or postgraduate medical courses to properly qualified persons who are citizens of the other American republics. Fellowships in public health will be open to physicians, sanitary officers, technicians, public health nurses, etc. These fellows will be selected through a system of cooperation with medical and health authorities of the different countries concerned, and whenever deemed advisable they will be interviewed by traveling representatives of the Pan American Sanitary Bureau. Each fellowship will provide living allowances while the holder is in the United States, travel costs, and tuition. Knowledge of the English language will be among the requirements, and also the possession of certain specific qualifications.

The Pan American Sanitary Bureau, the international health agency of the American republics, has been for some time the recognized clearing house for medical and public health fellowships in the United States, nearly 100 Latin Americans now being in the United States under its auspices.

Application blanks giving complete information will be available through the Commonwealth Fund, 41 East 57th Street, New York; the Pan American Sanitary Bureau, Washington, D. C.; or chiefs of American Missions in Latin America.

Follow-Up of Cases of Dementia Paralytica Requiring Indefinite Mental Hospital Care

(Preliminary Survey of 50 Cases)

ELVIN V. SEMRAD, M.D.; CLEMENTINE C. McKEON, M.D.,
and WILLIAM CORWIN, M.D.*
Waltham, Massachusetts

Dr. Semrad graduated from University of Nebraska in 1934, interned at University Hospital, Omaha, Nebraska, 1934-1935. Received post-graduate training in Psychiatry and Neurology at Boston Psychopathic Hospital (Boston, Mass.), McClean Hospital (Waverly, Mass.), Massachusetts General Hospital, Out-patient Department, and Metropolitan State Hospital. He is Instructor in Psychiatry at Boston University Medical School and Assistant in Psychiatry at Harvard Medical School. He is Senior Physician, Metropolitan State Hospital, Waltham, Mass., Diplomate in Neurology and Psychiatry, American Board of Neurology and Psychiatry. Dr. Semrad is on active duty in the U. S. Army.

Dr. McKeon graduated from Tulane University Medical School, 1932. She has been associated with the Metropolitan State Hospital since 1933 as Assistant Physician and Senior Physician. She is on staff of the New England Hospital for Women and Children, Boston; Psychiatrist at the Waltham Child Guidance Clinic; Assistant in Psychiatry at Boston University School of Medicine. Certified in Psychiatry by the American Board of Neurology and Psychiatry; Member of the American Psychiatric Association.

Dr. Corwin graduated from Tufts College Medical School in 1932. He has been at Metropolitan State Hospital since 1933 and is at present Assistant Superintendent. He is Instructor in Psychiatry at Boston University School of Medicine and Research Fellow, Fatigue Laboratory, Harvard University. He was formerly Research Associate in Neurology, Boston City Hospital. He is a Fellow of the American Psychiatric Association, and Diplomate of the American Board of Psychiatry and Neurology.

The variability of response of patients with dementia paralytica to modern methods of treatment, as well as the fact that statistically only one-third to one-half of these patients have any type of remission are well known observations. There remains a large number of patients who do not get remissions or die but who continue as hospital patients requiring an indefinite period of care. Studies on the details of such cases do not appear very frequently in the literature as far as the authors know. It has, therefore, been our plan to investigate fifty cases of dementia paralytica for the purpose of determining if possible some of the trends suggesting factors playing a role in preventing remissions and return to a community adjustment.

Method—Fifty cases of dementia paralytica were studied. The diagnosis of these cases has been made and treatment initiated at other hospitals in the Commonwealth. They were not selected except for the criteria that they were cases of dementia paralytica, requiring indefinite hospitalization since the onset of their mental handicap until the present time or their death. In our cases deaths were caused by conditions not related to their dementia paralytica. There were forty-four men and six women, ranging in their present ages from 38 to 77, distributed per decades as follows:

TABLE I
PRESENT AGE OR AGE AT DEATH

Age	Living		Dead		Total Cases
	Male	Female	Male	Female	
30-39	2	0	0	0	2
40-49	12	1	2	0	15
50-59	17	4	3	0	24
60-69	5	1	2	0	8
70+	1	0	0	0	1
Total	37	6	7	0	50

The largest number of patients were found in the fifth and sixth decades, more in the latter.

TABLE II
RACIAL GROUPS

Race	European				Unclassified		Total
	Northern		Southern				
	M	F	M	F	M	F	
Irish	10	2					12
English	10	1					11
Others, (Scandinavian, German, Russian, etc.)	6	1					7
Italian			5	0			5
Others, (Greek, Hungarian, Slavic, etc.)			3	0			3
Mixed, (American, etc.)	5	0			5	2	12
Total	31	4	8	0	5	2	50

* Metropolitan State Hospital.

The Northern Europeans made up 70 per cent of these cases, quite in contrast to the opinion of Hoskins,[1] who in a review of 359 cases concluded that Northern Europeans reacted more favorably to treatment than did Southern Europeans.

Our data is projected on the background of a distribution chart of 2,258 cases of dementia paralytica of Moore and Merritt.[2] Their cases deal with those admitted to the Boston Psychopathic Hospital between 1912 and 1934. The great majority of cases were found in the two decades between 30 and 50, with nearly equal distribution between the 30 to 40 and 40 to 50 periods. They felt there was a progressive increase with each decade up to the fourth and a progressive decrease after the fifth. Our cases had their onset of mental symptoms chiefly in the fourth and fifth decades, fewer in the sixth decade. As we did not include any congenital cases, lack of them in the second and third decades is more apparent than real. In Moore and Merritt's series of the 71 patients less than 25 years of age all but 14 were of the congenital type.

The largest percentage of cases had symptoms for only six months before treatment. Whether the fact that those sick longer died by now and did not require care must be considered. Usually it is assumed that the sooner treatment is instituted after development of symptoms the better the prognosis tends to be. However, our figures bring up a point of discussion on this matter.

Eighty-two per cent of our cases have been hospitalized for more than five years, i.e., up to the present time or up to the time of their death. It is of interest also that at the present time 40 per cent are of the demented type. More in relation to clinical types at onset and at present will be discussed in relation to Table VI.

A difference of opinion regarding the relationship of the clinical type of dementia paralytica to the prognosis exists among investigators.[3,4,5] However, they seem to agree that the depressive and grandiose types have the best, while the demented forms present the poorest prognosis. There is a divergence of opinion on the other types. Greenhill and Yorshis[6] gave the best prognosis in the delirious, apathetic and agitated types. The

Table III

Age at Onset of Mental Symptoms

(Projected on Age Distribution Chart of 2258 Cases of Dementia Paralytica*)

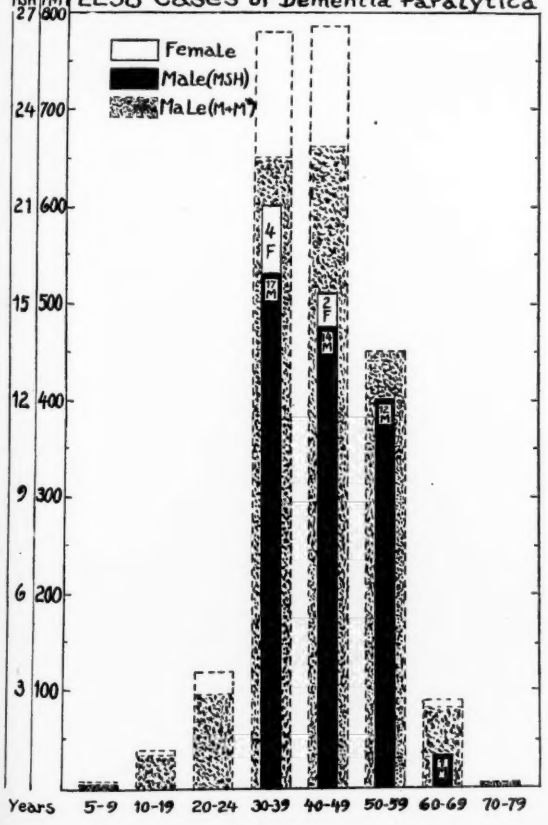
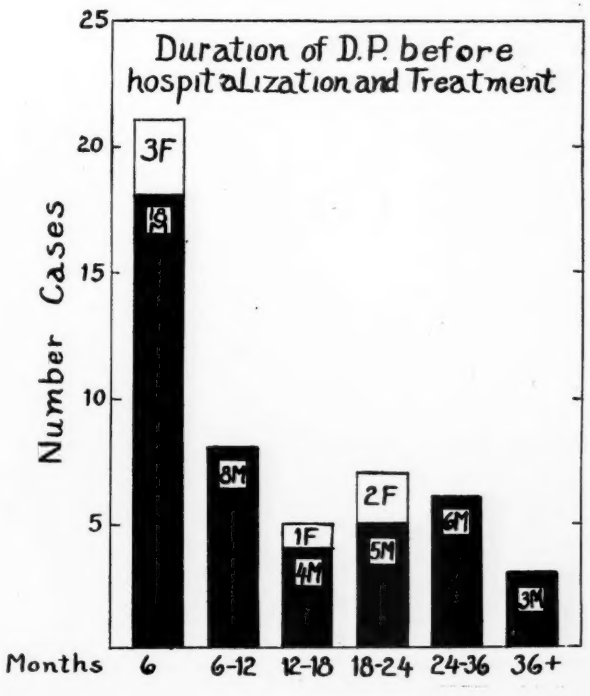


Table IV



majority of their grandiose cases remained hospitalized as well as the demented type and those with schizophrenic-like symptoms.

In our cases, the demented group was the largest (28 per cent of the cases at onset and swelled by addition of other groups to at present 48 per cent of the cases). The other groups that contributed to the demented present clinical pictures were three cases from the expansive, three from the delirious, two from the agitated, three from depressed, and one from the schizophreniform types at onset. It is also of interest to comment upon the fact that only four of the originally eleven depressed patients remained depressed. Only five of the eight expansive patients remained expansive, and seven of the eight with schizophrenic-like symptoms retained them.

All the cases showed clinically marked intellectual defects and an appraisal of them was attempted by the Well's memory test* given by our psychologist, Miss Eva L. Stromwall. Thirty-four cases were tested. Details of psychometric reports will be published in a subsequent study.

Because of the few cases involved and the extensive range of some frequency distributions, we decided to express quantitatively the results in terms of average deviation of the individual scores from the decade norms established by Shakow.[7] It is significant that all the above averages are below their decade norms; thus memory loss is indicated and this is relatively greater for new recall than

* Worcester modification of the Well's Memory Test loaned to us by Dr. Shakow.

TABLE V

DURATION OF HOSPITALIZATION

No. Years Hospitalized	*Alive*	*Died*	*Total*	*%*	*Clinical Type at Onset*						*Clinical Type Now*					
					Dem.	*Dep.*	*Exp.*	*Schiz.*	*Del.*	*Agit.*	*Dem.*	*Dep.*	*Exp.*	*Schiz.*	*Del.*	*Agit.*
0-2.5 yrs. (2.4=av.)	3	1	4	8	2	0	0	1	0	0	2	0	0	1	1	0
2.5-5 yrs.	4	1	5	10	0	2	1	1	1	1	2	1	1	1	0	0
5-7.5 yrs.	10	1	11	22	3	1	1	3	2	1	6	0	2	2	0	1
7.5-10 yrs.	6	2	8	16	3	2	0	1	1	1	3	1	3	1	0	0
10-15 yrs.	17	2	19	38	5	6	5	1	2	0	10	2	4	3	0	0
15+ yrs.	3	0	3	6	1	0	1	1	0	0	1	0	1	1	0	0
Total	43	7	50	100	14	11	8	8	6	3	24	4	11	9	1	1
Percent	86	14	100	100	28	22	16	16	12	6	48	8	22	18	2	2

TABLE VI

CLINICAL PICTURES

Clinical Type at Onset			*Clinical Type Now*													
	No.	*Pct.*	*Demented*		*Depressed*		*Expansive*		*Schiz.*		*Delirious*		*Agitated*		*Total*	
			No.	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*	*No.*	*Pct.*
Demented	14 (2f)	28	(2f) *12	24			2	4							14	28
Depressed	11	22	3	6	*4	8	3	6	1	2					22	22
Expansive	8 (1f)	16	3	6			(1f) *5	10							8	16
Schiz.	8 (3f)	16	1	2					(3f) *7	14					8	16
Delirious	6	12	3	6			1	2	1	2	*1	2			6	12
Agitated	3	6	2	4									*1	2	3	6
Total	50	100	24	48	4	8	11	22	9	18	1	2	1	2	50	100

*Indicates those remaining of original.

TABLE VII

AVERAGE DEVIATIONS OF INDIVIDUAL FROM DECADE SCORES

Decade	Old Recall	New Recall	New Recognition	Total Memory
30-39 (N=2)	(66.7)*	(68.)	(16.6)	(151.3+)
	−20.2	−49.5	−7.6	−77.8
40-49 (N=8)	(66.1)	(60.7)	(15.4)	(142.2)
	−28.7	−41.9	−5.8	−77.8
50-59 (N=19)	(62.3)	(49.3)	(13.0)	(124.6)
	−16.4	−24.8	−3.5	−43.2
60-69 (N=5)	(60.2)	(41.3)	(13.6)	(115.1)
	−22.0	−25.0	−2.0	−49.1

*Decade norms for normals taken from Shakow.[7]

old recall in the fourth, fifth and sixth decades.

Relative to neurologic dysfunction, the criteria used were those adapted from Greenhill and Yorshis[6] as follows: Mild=anisicoria and hyperactive reflexes; moderate=includes Argyll-Robertson pupils, dysarthria and hyperactive deep reflexes; marked=includes A-R pupils, dysarthria, circumoral tremors, optic atrophy, absent deep reflexes, pronounced tabetic involvement, masticatory automatism, ideational apraxia, and the like.

Twenty per cent of our cases had tabetic involvement on admission. Up to the present time, 16 per cent more developed tabetic signs, giving a total of 36 per cent. Fifty per cent of the cases showed moderate changes on admission, the mild and marked changes approximately balancing up the remainder. Some of the cases progressed so that at the present time marked changes are found in 52 per cent. The women tended to show less neurologic involvement than did the men. The number of patients is too small to be very significant. Five of them had convulsions.

Two of our series had pneumoencephalograms.* G. A. showed marked generalized cerebral atrophy, deep and superficial, with cortical involvement and ventricular enlargement. J. U. showed moderate bilateral ventricular enlargement, with some evidence of cortical atrophy giving the impression of generalized cerebral atrophy. The filling with air was not considered complete.

Seven patients died of causes unrelated to their dementia paralytica. The average age at death was 55 plus years, ranging from 44 to 65. Four died of bronchopneumonia—one associated with fracture of the femur, one associated with cardiac decompensation caused by hypertensive cardiorenal vascular disease, and one associated with a toxic atrophic cirrhosis of the liver with splenomegaly and esophageal varices, right heart dilatation, and bilateral simple nephrosis. One died of general peritonitis due to perforated gastric ulcer. The last patient, hospitalized for the shortest time (1.3 years), died of terminal bronchopneumonia, associated with multiple pulmonary emboli, right heart dilatation, acute splenitis, degeneration of the liver, general arteriosclerosis, coronary sclerosis, nephro-

* Taken from hospital records. Interpretations by Dr. T. J. C. Von Storch.

TABLE VIII

NEUROLOGICAL DYSFUNCTION

	At Onset					Now									
Diagnosis	No.	%	Degree Involvement	No.	%	Dementia Paralytica		Tabo-Paresis		Mild		Moderate		Marked	
						No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Dementia Paralytica	(5f) 40	80				(4f) 32	64								
Tabo-Paresis	(1f) 10	20						(2f) 18	36						
			Mild	(5f) 13	26					(3f) 5	10				
			Moderate	(1f) 27	54							(1f) 19	38		
			Marked	10	20									(1f) 26	52
Total	50	100		50	100	32		18		5		19		26	

sclerosis, and frontal lobe tumor.

Treatment of the original systemic syphilitic infection was thought to be adequate in only 10 per cent, inadequate in 24 per cent, unknown or none in 66 per cent of the cases, the data being entirely too unreliable for drawing any conclusions.

The initial treatment for the general paresis was by fever therapy, chemotherapy, combined fever and chemotherapy. Three of the cases had no treatment and in four it was difficult to determine the nature and extent of the treatments. Forty-six per cent were treated by fever therapy: fourteen with malaria, one with typhoid, three with diathermy, two with artificial fever, one with sodoku and typhoid combined, and two with malaria and typhoid combined. Chemotherapy consisted of tryparsamide (7 cases), and combinations of arsphenamine, bismuth (6

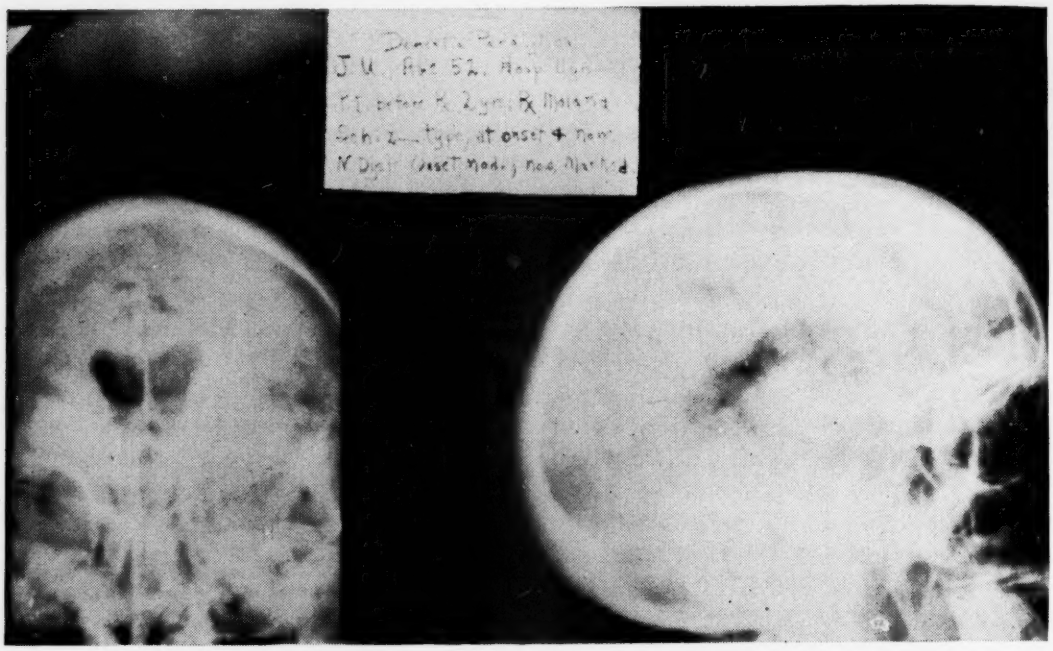


TABLE 9

cases). Fourteen per cent had combination fever and chemotherapy, usually consisting of tryparsamide given before the fever therapy was instituted. Attempts at subsequent fever therapy were not very favorable, so that usually the treatment had to be terminated before completion. Malaria was attempted in four cases, diathermy in four, and typhoid in four. All but three cases which were not treated had chemotherapy follow-up consisting of tryparsamide, arsphenamine, and the various bismuth preparations, with several instances of mercury treatment, this being continued to the time of death or negative serologic reactions. There is very little doubt that these patients have had a large amount of treatment and if some comments were to be made about possible deficiencies they would refer to an inadequacy of the amount of tryparsamide given.

The spinal fluid studies are not evaluated in detail in this communication, but it may be stated that all cases on admission had positive spinal fluid Wassermann tests. Only two had their first negative reactions at the end of the first year, five at the end of the second year, thereafter the time becoming progressively increased with the maximum at six and seven years of treatment. There remained a positive spinal fluid Wassermann test in only three instances after the ninth year. The initial cell counts were in the neighborhood of 10 to 20 cells in the majority of cases (with three running around 150 cells at onset). The majority of cell counts came down to normal (below 6) within the first year. The initial total protein ranged around 70 mgm. per cent—in one case going as high as 190 mgm. per cent and in another 180 mgm. per cent. The total protein tended to drop down to normal limits within the first year of treatment in most instances. Some laboratories reported in terms of globulin ranging from 2 to 3 plus at time of admission.

Summary

Fifty cases of dementia paralytica were studied, most of them being now in the fifth and sixth decade. They were mostly Northern Europeans, having the onset of mental symptoms chiefly in the fourth and fifth decades, were sick about six months prior to hospitalization and treatment. To the present time or to the time of death, 82 per cent had been hospitalized for more than five years. Most of the cases at present are of the demented type, showing intellectual impairment in terms of memory loss, which is relatively greater for new than for old recall. Most of the cases show marked neurologic dysfunction, the women showing much less neurologic dysfunction than the men. Seven patients died of causes other than those related to dementia paralytica. The treatment instituted at the onset of symptoms consisted of various forms of fever, chemical and combination therapies, and showed that infection was well controlled. It would seem that even if treatment was adequate and given early, deterioration in most cases was not prevented, but merely delayed in its progression.

References

1 Hoskins, John Leroy: *Ural and Cut. Review*, Vol. 45, pp. 61-64.

2 Merritt, H.; Houston, H., and Moore, Merrill: *New Eng. J. of Med.*, Vol. 215, No. 3, p. 109.

3 Solomon, H., and Epstein, S.: "Dementia Paralytica: Results of Treatment with Tryparsamide," *Arch., Neur., and Psychiat.*, 33: 1216-1231 (June) 1935.

4 Solomon, H., and Epstein, S.: "Dementia Paralytica: Results of Treatment with Malaria in Association with Other Forms of Therapy," *Arch., Neur., and Psychiat.*, 33: 1008-1021 (May) 1935.

5 Freeman, W.; Eldridge, W. W., and Hall, R. W.: "Malaria Treatment of Dementia Paralytica: Results in 205 Cases After 5-11 Years," *South. M. J.*, 27: 122 (Feb.) 1934.

6 Greenhill, M. H., and Yorshis, M.: "Prognostic Criteria in Dementia Paralytica," *Am. J. of Psychiat.*, Vol. 97, No. 3, pp. 167-188 (July) 1940.

7 Shakow, D.: *Personal Communication.*

Interpretations of the Spinal Fluid in Neurosyphilis

AUGUSTUS S. ROSE, M.D.*
Boston, Massachusetts

Augustus S. Rose graduated from Harvard Medical School, 1932. He is Instructor, Department of Neurology, Harvard Medical School; Assistant in Therapeutic Research, Boston Psychopathic Hospital; Diplomate of the American Board of Psychiatry and Neurology.

A study of the spinal fluid is essential in the diagnosis and intelligent management of neurosyphilis. The evaluation of the tests performed on the fluid, whether they be normal or abnormal, depend upon an understanding of the physiology of the cerebrospinal fluid and the basic neuropathology of the disease. There are many questions yet unanswered in regard both to the physiology and pathophysiology of the cerebrospinal fluid that would aid in the interpretation of both clinical and laboratory data in neurosyphilis. Foremost among these unsolved problems is the origin and significance of the protein. That this is of importance in neurosyphilis is attested to by the frequency of increases in the globulin and total protein and by the surprising fact that although the fluid removed from the lumbar sac may have marked changes in the cell count, protein, gold sol and the Wassermann reaction, the fluid obtained from a lateral ventricle of the same individual may be normal and have a negative Wassermann test. Investigations on this interesting problem are now in process and I regret that they have not progressed sufficiently to report on them at this time.

During the primary and secondary stages of syphilis there is a generalized invasion of the body by the spirochetes, in which the central nervous system rarely escapes. This is evidenced by symptoms, serologic changes and the presence of spirochetes in the cerebrospinal fluid. In the majority of cases, however, this early evidence of central nervous system involvement disappears and shows no later change, but in from 30 to 40 per cent this evidence of immunity is lacking and the organisms remain only to produce symptoms months or years later.

Pathologically, neurosyphilis begins as a meningitis. This early meningeal reaction may subside and all evidence of neurosyphilis disappear, or the process may extend to the blood vessels or to nerve tissue. In any case the pathologic process is not confined either to the meninges, blood vessels or nerve tissue but is predominantly in one or the other. A number of years is required for the development of parenchymatous neurosyphilis and during that period of development localized or diffuse meningitis may also be present. Indeed, on clinical grounds, it is difficult in many cases to distinguish between chronic meningovascular syphilis and general paresis, Furthermore, the cases which pathologically become predominantly vascular neurosyphilis often have symptoms suggestive of general paresis.

During the years between the early central nervous system invasion by the spirochetes and the subsequent development of the clinical symptoms of any type of neurosyphilis, the spinal fluid will be found to be abnormal. The spinal fluid of these cases of asymptomatic neurosyphilis usually is the only clue to the presence of central nervous system infection, and the character of the spinal fluid change is the only evidence of the nature and extent of the pathologic process.

The spinal fluid changes in asymptomatic cases may be generally classified according to the degree of abnormality:

Group	*Cells per cu. cm.*	*Total Protein mgs. %*	*Globulin*	*Gol. Sol.*
I	5 to 20	30 to 50	Positive	0000000000
		Wassermann Reaction		
		Negative or Doubtful or Weakly Positive.		
Group	*Cells per cu. cm.*	*Total Protein mgs. %*	*Globulin*	*Gol. Sol.*
II	20 to 60	40 to 70	Positive	2344321000
		Wassermann Reaction		
		Weakly Positive or Strongly Positive.		
Group	*Cells per cu. cm.*	*Total Protein mgs. %*	*Globulin*	*Gol. Sol.*
III	20 to 100	60 to 150	Positive	5555543200
		Wassermann Reaction		
		Strongly Positive.		

* From the Boston Psychopathic Hospital.

The spinal fluid of Group I indicates minimal involvement and is the type most frequently found in early syphilis if the central nervous system is involved. Routine treatment is most often sufficient to return the fluid to normal, as, indeed, the fluid may become normal even though treatment is inadequate. A Group I type of fluid is also frequently obtained in late cases of vascular neurosyphilis. In such incidences the fluid does not return to normal as promptly as in the early cases.

The fluid of Group II is the type most frequently found in asymptomatic neurosyphilis. The response to treatment is less satisfactory and tryparsamide and occasionally fever therapy may be necessary to reverse it. Group II is also the type reaction obtained in many cases of meningovascular syphilis as well as in some cases of tabes dorsalis.

Group III spinal fluid is the so-called "Paretic Formula" and is the most resistant to treatment. Fever therapy is almost always required to satisfactorily influence the fluid. Not all cases in which this type fluid is obtained develop general paresis, but its resistance to treatment would indicate that the infection has obtained a strong footing in the nervous system and subclinical parenchymatous involvement may have occurred. In fully developed clinical neurosyphilis Group III is to be found in general paresis, acute syphilitic meningitis and, not infrequently, in meningovascular syphilis.

As indicated by the response to treatment, in both symptomatic and asymptomatic cases, the degree of abnormality of the spinal fluid as a whole can be accepted as a rough indication of the extent of involvement and, therefore, of prognosis. This generalization, however, does not hold in the presence of acute syphilitic meningitis, in which all tests, including the gold sol, may be strongly positive and yet the case responds well to treatment.

Of the individual tests performed on the fluid the Wassermann reaction is the most informative. The frequency with which a first zone gold sol reaction occurs in general paresis has led to the interpretation that it is an indication of parenchymatous involvement. A weak gold sol and Wassermann combined renders the diagnosis of general paresis unlikely. A strong gold sol and Wassermann test may occur in other forms of neurosyphilis. The cell count is an index to the presence and extent of meningitis.

Turning now to more specific data, what are the characteristic findings in the spinal fluid of the different types of neurosyphilis and what is there to be learned from repeated examinations of the fluid during therapy?

In a random selection of sixty cases of general paresis, twenty-five of tabes and twelve of meningovascular syphilis from the records of the Boston Psychopathic Hospital, I have averaged the individual determinations and obtained the following changes which appear characteristic of these three types of neurosyphilis:

	Cells	*Total Protein*	*Gol. Sol.*	*Wassermann Reaction*
General Paresis	27	88	5554321000	5555552
Tabes	4	34	3443210000	5554...
Meningovascular	56	97	2234321000	555554.

The treatment of all of these cases was essentially the same. The majority of each group were managed by one or more forms of fever therapy and subsequently by chemotherapy until reversal of the spinal fluid Wassermann test was obtained. Fifty-two of the sixty paretics, nineteen of the twenty-five tabetics and seven of the twelve cases of meningovascular syphilis were given fever therapy, the remaining ones chemotherapy (tryparsamide and other heavy metals) alone. Using the Wassermann test as the indicator and accepting the first negative or the second doubtful reaction (six months apart) as the time of reversal, the first clear distinction between the serologic response of the cases is strikingly shown. The paretics reversed in an average of 4.6 years, the tabetics in 3.0 years and the meningovasculars in 1.4 years. In all cases of all three groups the cell count and total protein were the first to return toward normal. The Wassermann reaction was next to change and the gold sol last. At the time of the reversal of the former a majority (general paresis 37; tabes 10; meningovascular 9) persisted in having an abnormal gold sol. In many of these, later

examinations showed the gold sol test to be negative. During the course of therapy the gold sol findings frequently fluctuated within certain limits, and when unaccompanied by other changes appeared as no indication of a forthcoming serologic relapse, nor as an indication that a greater length of time would be necessary to reverse the Wassermann reaction. On the other hand a rise in protein and cell count after a previous sustained fall was usually accompanied by a stronger Wassermann reaction and, therefore, accepted as evidence for serologic relapse of greater or lesser degree. Furthermore, a comparison of the fluids in cases of general paresis with good and poor clinical results shows that the protein and cell count returns toward normal more promptly in those who obtained a good therapeutic result.

A discussion of the spinal fluid in neurosyphilis in Massachusetts would be incomplete without mention of the Davies-Hinton test, which only recently has been suggested as a substitute for the Wassermann reaction. In our clinic the Davies-Hinton test has been shown to be more sensitive and in doubtful cases a little less reliable than the Wassermann. The chief objection to it, however, is that it cannot be run in dilutions and does not, therefore, offer the same helpful guide in therapy. Insufficient experience has yet been gained in those cases with a positive blood and a positive Davies-Hinton test without other evidence of neurosyphilis, to determine its significance with respect to the ultimate outcome. In general paresis the Davies-Hinton test remains positive from six months to two years after the reversal of the Wassermann reaction and in many instances becomes negative without additional treatment. On the other hand it is rare to find a negative or doubtful Davies-Hinton test in a case of neurosyphilis when other abnormalities of the spinal fluid are present. The results of all spinal fluid tests from the Boston Psychopathic Hospital performed by the Massachusetts State Wassermann Laboratory during the year 1940 are tabulated for comparison:

	Wassermann	*Davies-Hinton*
Total	1017	837
Positive	279	314
Doubtful	49	6
Negative	693	515
Unsatisfactory	5	2
False positive (no other evidence of lues)	0	2
False doubtful (no other evidence of lues)	0	2

Summary

The initial spinal fluid examination in a case of neurosyphilis is essential in the establishment of that diagnosis, is helpful in determining the type of involvement but does not establish the prognosis. Repeated examinations of the fluid are essential for the adequate therapy and the understanding of the pathologic process involved. Although there are exceptions, the Wassermann reaction is strong in general paresis, moderate in meningovascular neurosyphilis and weak in tabes. The spinal fluid in cases of parenchymatous neurosyphilis reverses more slowly than in other types. Reversal of the spinal fluid in one year or less is strong evidence against the diagnosis of general paresis irrespective of the clinical symptoms and treatment. In general paresis an early return of the total protein and cells to normal levels is a fair indication of a probable satisfactory outcome and, conversely, an increase above normal or a persistence in abnormal levels of cells and total protein while under treatment indicates a possible relapse and the need for more intensive treatment. The gold sol test is helpful in the diagnosis, but taken alone is of no value as a guide to treatment. A fluid which remains strongly positive in all elements and unaffected a year or more after beginning specific treatment shows that some other form of management should be considered. The Davies-Hinton test is valuable and sensitive for the diagnosis, but because it cannot be run in dilutions is less helpful than the Wassermann reaction as a guide to treatment.

The Electroencephalogram in Neurosyphilis*

KNOX H. FINLEY, M.D., AUGUSTUS ROSE, M.D., *and*
HARRY C. SOLOMON, M.D.**
Boston, Massachusetts

Dr. Finley graduated from Yale University School of Medicine, 1930. He was Resident Neurologist at Massachusetts General State Hospital in 1936 and Resident Psychiatrist at Boston Psychopathic Hospital, 1937 to 1939. Instructor, Department of Psychiatry, Harvard University. He is Assistant Professor of Neuropsychiatry, University of Oregon Medical School, Portland. He has been certified in Psychiatry by the American Board of Neurology and Psychiatry. He is a member of the American Neurological Association.

The electroencephalogram is an adjunct to other neuropsychiatric clinical and laboratory procedures. It is proving to be a valuable instrument in furthering our understanding of neuropsychiatric illnesses and, when used with other laboratory and clinical studies, its findings may aid in the diagnosis.

It was with this point of view that the authors undertook the studies of brain potentials in neurosyphilis. The present report is a follow-up on a similar study presented before the American Neurological Association in June, 1941.[1] The study is based on one or more records from 200 cases of various types of neurosyphilis (general paresis, 140; tabes, 24; meningovascular, 15; juvenile paresis, 13; and optic atrophy, 8).

The tracings reported in this study were obtained from a six-channel apparatus of the Grass make. Routinely, electrodes were used over the frontal, precentral, and occipital areas of each hemisphere with the indifferent electrode placed over the mastoid. With the six-channel apparatus, simultaneous recordings were possible from each of the three electrodes of the two hemispheres (Fig. 1).

The records thus obtained have been divided into three groups: normal (samples 1 and 2, Fig. 2), borderline (samples 4 and 5,

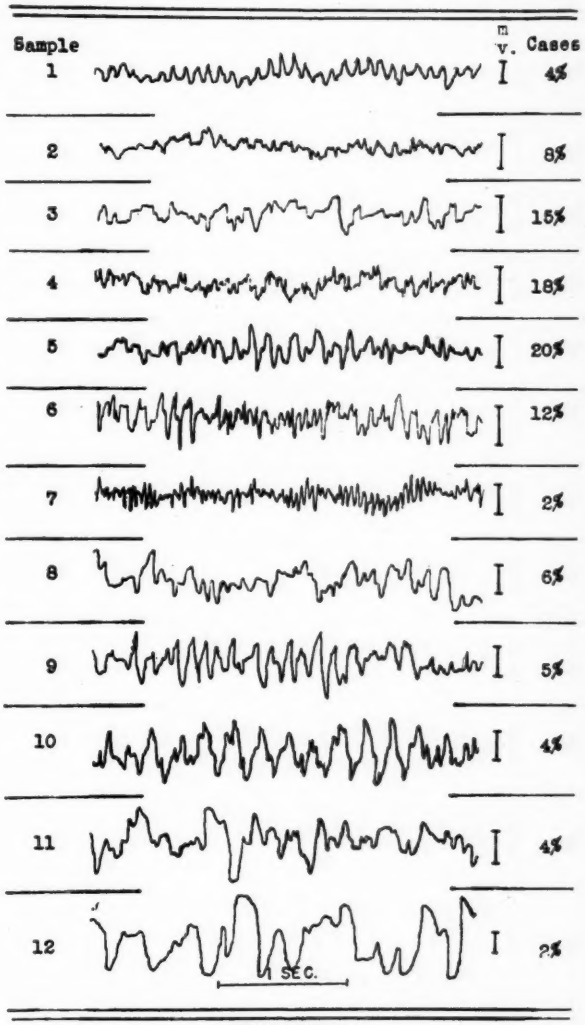
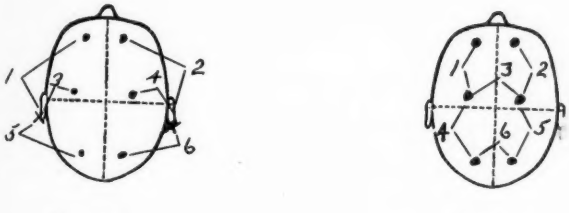


FIGURE 2

Samples of twelve different types of records including normal (samples 1 and 2), borderline (samples 4 and 5), and abnormal (samples 3 and 6 through 12) tracings demonstrating the lack of consistency in E.E.G. tracings of patients with neurosyphilis. With the exception of sample 12, a juvenile paretic, all samples were taken from cases of general paresis. The tracings were recorded from the left precentral with the mastoid as the reference point. The vertical lines at the right of the samples represent a 50 microvolt vertical deflection of the recording oscillograph pen. The percentage figures in the right hand column indicate the percentage of cases from the total 200 neurosyphilitic patients whose first E.E.G. tracings resemble the sample. This lack of consistency in the character of the pattern holds not only for the neurosyphilitics as a whole, but also for the various type of neurosyphilitics, i.e., general paresis, tabes, optic atrophy, and juvenile paresis.

Fig 1.



* Work supported by grants from the Scottish Rite Masons and Proctor Funds.
**Boston Psychopathic Hospital and Department of Psychiatry, Harvard Medical School.

Fig. 2), and abnormal (samples 3 and 6 through 12, Fig. 2). The basis of normality was determined by the occurrence of similar patterns in normal controls and patients with known organic disorders of the central nervous system.

When the first tracing taken on each of the 200 cases of neurosyphilis (both treated and untreated) are divided into normal, borderline, and abnormal patterns and compared with the percentage distribution of the records from 215 normal controls, 70 per cent of the records from the controls are normal in contrast to only 20 per cent of the patients with neurosyphilis. Twenty-three per cent of the records from the controls and 28 per cent from the patients fall in the borderline range; while only 7 per cent of the control group have abnormal records, 50 per cent of the records from neurosyphilis patients are abnormal.

It is of especial interest that most of the cases showing normal tracings were general paretics where the cortical lesions are more prominent. This finding emphasizes the fact that normal electroencephalograms do not necessarily rule out lesions of the cortex. One would expect a greater percentage of abnormal E.E.G.'s in that type of neurosyphilis where cortical lesions are predominant, that is, general paresis. However, our studies show that abnormal potentials are just as common in tabes and optic atrophy. This raises the problem if lesions of the upper brain stem and base of the cerebrum which are common in all types of neurosyphilis, are not primarily responsible for the abnormal tracing. This point will be briefly mentioned later.

Figure 2 illustrates the great variety of patterns included in neurosyphilis. Twelve different types of patterns were arbitrarily chosen. All the first tracings obtained on the 200 cases were classified with the sample which they most nearly resembled. The percentage distribution is given to the right of each sample in the figure. This lack of consistency in the E.E.G. tracings not only in cases of neurosyphilis as a whole, but also in the clinical subtypes, does not permit one to place any diagnostic significance on the character of the electrical potentials. This point is further strongly supported by the fact that these same patterns are found in a variety of other neuropsychiatric disorders. Rapid activity resembling that found in samples 4, 6, and 7 is frequently encountered in the manic depressive disorders, agitated depressions of middle age, schizophrenia, and occasionally in epilepsy. Likewise, the slow activity illustrated in samples 9 through 12 are found in a variety of neurologic conditions, particularly epilepsy.

A comparison of the percentage distribution of normal, borderline, and abnormal E.E.G. tracings in treated and untreated cases of general paresis shows that the treated group have 16 per cent fewer abnormal records and 15 per cent more normal records than does the untreated group. Further analysis of these treated and untreated cases shows that the clinically severe group are more likely to show the most abnormal tracings. In 18 cases which had become serologically negative following treatment, the E.E.G. tracings show a high percentage of normal records (Table 1).

TABLE 1

EIGHTEEN TREATED CASES WHICH ARE SEROLOGICALLY NEGATIVE

Clinical Result	*E.E.G. Normal*	*E.E.G. Borderline*	*E.E.G. Abnormal*
Remission	4	5	1
Improved	6	1	
Unimproved		1	

The E.E.G. tracings are tabulated against the clinical results and show a high percentage of normal records.

In Figure 3 are illustrated a series of records on a case of general paresis and tabes illustrating how tracings may improve with treatment. In most cases, the E.E.G. improves or becomes worse with the clinical course. However, there are many exceptions. The E.E.G. tracings may remain unchanged during treatment with clinical improvement and vice versa. One of the most significant findings in our studies is that in the great majority of cases showing abnormal records, the abnormal activity is similar from homologous areas (Fig. 4). This symmetry of the cerebral electrical potentials persists whether the record improves or becomes more abnormal. As the central nervous system lesions in such cases are not likely to be symmetrically placed, this finding suggests that there may be a pacemaker which maintains the uniformity of the E.E.G. pattern from homologous areas.

That the pacemaker may lie in the upper mid-brain or in some basal structure of the cerebrum has been suggested above by the fact that abnormal records are as frequent in tabes and optic atrophy as in general paresis. However, recent work by Cannon and Rosenbluth* suggests that certain areas of the cortex may act as a pacemaker and one area of the cortex may take over the function of pacemaker from another. In view of this work, it may not be necessary to assume that a pacemaker must exist in some more central part of the cerebrum as in the basal structures or upper mid-brain. The final answer to these somewhat hypothetical points must await further investigation.

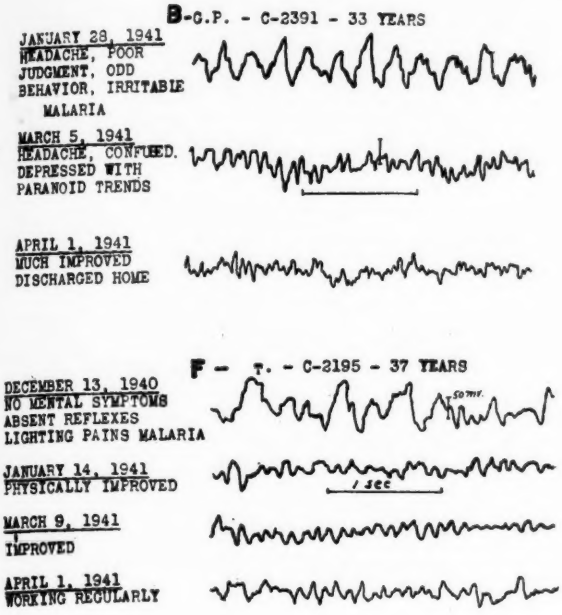


FIGURE 3

Two cases, B—a general paretic, and F—a tabetic, showing improvement in a tracing following treatment.

An attempt has been made to correlate rapid frequency (samples 4, 6, and 7) and slow frequency patterns (samples 9 through 12) with the clinical picture. In general paresis, rapid activity is more frequently encountered in those cases in which the psychotic elements predominate, while slow activity is more often found in those cases in which neurologic signs stand out in the clinical picture. In juvenile paresis slow activity is more common. The fact that the infection involves the brain before it reaches maturity in these cases may account for the predominance of slow activity.

Reference

1 Finley, Knox H.; Rose, Augustus S., and Solomon, C.: "Electroencephalographic Studies in Neurosyphilis," *Arch. Neur. and Psychiat.*, 47: 718-737, (May) 1942.

* Personal communication.

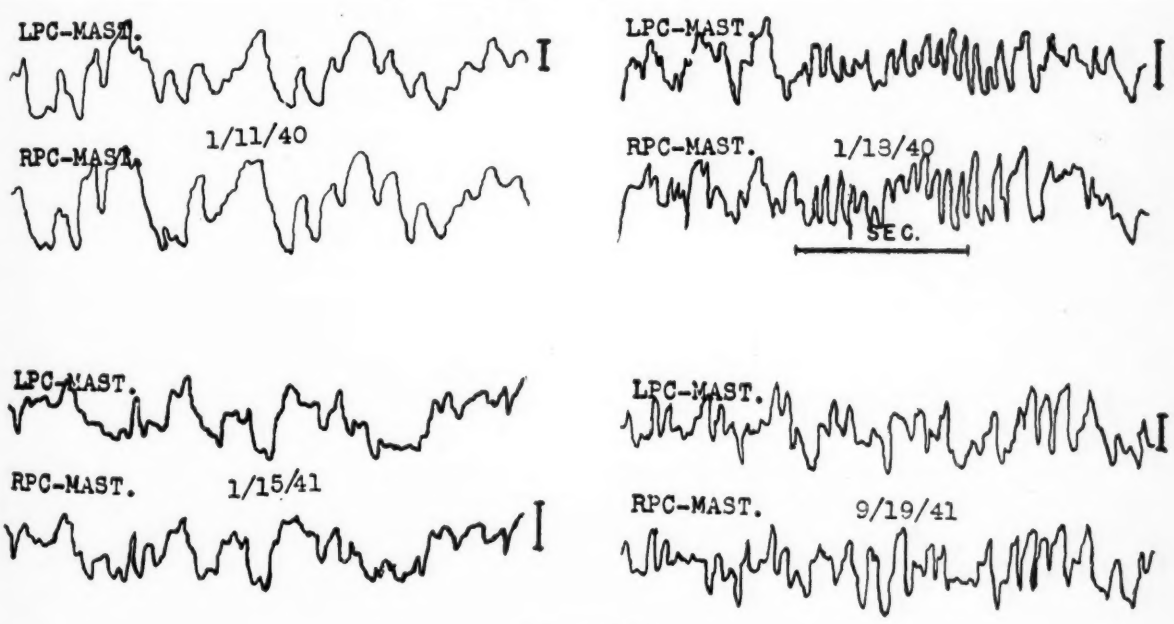


FIGURE 4

The figure demonstrates the similarity of abnormal activity from homologous areas in a series of records taken before, during, and following treatment in a case of neurosyphilis. Treatment was started between the first two samples (1/1/40-1/18/40). Note particularly the similar change in the patterns from the two homologous areas (precentral) with improvement of the tracings.

Congenital Syphilis in Mental Defectives

CLEMENS E. BENDA, M.D.* *and* HENRY A. TADGELL, M.D.**
Boston, Massachusetts

Dr. Benda graduated from the University of Berlin, 1922. He served in the Psychiatric Clinic, Heidelberg, 1922-1923, and from 1923-1928 in the State Hospital and Sanitarium, Switzerland. He has been connected with the Neurological Department, Hamburg, 1929-1935, and was Associate Neurologist, Department of Neurosurgery, Red Cross Hospital, Berlin, and is on staff of Massachusetts General Hospital and Harvard Medical School, Boston. He is Director of Clinical Psychiatry, Wrentham State School. He is a Diplomate of the Board of Neurology and Psychiatry, and a Member of American Neurological Association, American Association of Pathologists and Bacteriologists; American Association on Mental Deficiency; Chairman of Committee on Research, 1941-1942.

Dr. Tadgell graduated from Tufts College Medical School, 1929. After an internship at Salem Hospital, Salem, Mass., he became Assistant Physician at Danvers State Hospital, 1930-1931, later Senior Physician, 1931-1934. He served as Assistant Superintendent at Wrentham State School, 1934-1941. He is a member of the American Association for the Advancement of Science, American Association on Mental Deficiency, and a Diplomate, American Board of Psychiatry and Neurology.

The relationship of congenital syphilis to mental deficiency has been the subject of several investigations, and yet, there are many fundamental problems which are still obscure. It is beyond the province of this presentation to discuss the literature in detail. Most of the investigations which dealt with the subject in the pre-Wassermann era are nowadays out-dated; on the other hand, some publications based on a too optimistic view of the specificity of the Wassermann test or similar sero-reactions, came to equally erroneous conclusions. The complexity of the problem calls for a combined approach from several directions and it will be shown that such a coordination of several viewpoints allows rather definite conclusions, while each method alone covers only a small part of the cases under investigation.

In his well-known book, Solomon[1] discusses the incidence of congenital syphilis among the feebleminded. His own investigation of the blood Wassermann test on 1565 patients at Waverley produced a 4.5 percentage. The average of the figures given in his table shows that the Wassermann reaction is positive in 6.0 per cent of the children surveyed in the institutions for the feebleminded in America. In 1925, Dayton[2] published a paper on congenital syphilis as a cause of mental deficiency. He found that it occurred in 5.4 per cent among mentally defective patients, while a comparison with non-defective children revealed 4.3 per cent. His conclusions indicated that the incidence of congenital syphilis in mental defectives of all ages and in non-defectives showed only a slight margin of difference. Any conclusion drawn from this comparison as to the importance of congenital syphilis would, however, be premature and easily lead to fallacious results. It is obvious that the larger the population of defective persons under investigation, the more morons and borderline cases are included, and the closer is the approximation of the two groups. In any large statistical survey, the idiots and low imbeciles are less conspicuous; they escape attention even more because of the fact that the percentage of positive blood reactions in this group is less than in the higher group. This problem will be dealt with extensively later.

In 1929, Woodall,[3] presented a study on the incidence of congenital syphilis in an institution for the feebleminded (Walter E. Fernald State School, Waverley). The most striking item of his study was that only 1.37 per cent of the population had positive blood serology at the time of his investigation. He demonstrated that this percentage should not be confused with the incidence of congenital syphilis in mental deficiency. A survey of the records produced evidence that almost as many cases were found which had previously had positive blood serologic tests that had become negative. Woodall pointed out that "over half of the positive Wassermann cases which had no treatment recovered spontaneously as measured by serology" (page 243). A third group of cases revealed definite positive clinical evidence with no positive reaction on record. By adding these three groups, a final percentage of 6.5 of congenital syphilis was present, leaving the doubtful cases out of discussion. In Woodall's material, the highest percentage of congenital syphilis was

* Clinical Director, Wrentham State School, Wrentham, Massachusetts, and Instructor in Neuropathology, Harvard Medical School.
**Director, Division of Mental Deficiency and Statistics, Massachusetts Department of Mental Health.

present in the imbecile group. He found:

Morons	6.5%
Imbeciles	8.9%
Idiots	5.6%

From these groups he excluded the neurologic cases, finding 11.1 per cent of syphilis in hydrocephaly, 7.1 in microcephaly, and 3.9 per cent in cases of paralysis (spastics). Since several of the hydrocephalics and microcephalics in an institution rank psychologically as imbeciles or idiots, these cases add to the high percentage of congenital syphilis in the lower mental groups. Solomon[1] feels that, although hydrocephalic idiocy has been thought to be caused by congenital syphilis in a high percentage of the cases, this is probably not true. "Congenital syphilis has been found by us to be more frequent in cases of microcephalus than in hydrocephalus." From the view point of pathology one may add to this controversy that the striking cases of hydrocephalus with enlargement of the head from 25 to 36 inches are rarely, if ever, attributable to congenital syphilis. Congenital syphilis is frequently the cause of hydrocephalus internus of moderate degree, but for reasons still unknown syphilitic hydrocephalus does not reach the dimensions of hydrocephaly on the basis of congenital malformations.

The most recent valuable study on the subject is based on similar material, that of the Caterham Mental Hospital, England, by Paddle.[4] This author made a comparative study of the Wassermann and Meinicke-Kahn reactions and established in this way a percentage of 3.9 per cent of positive findings among 2000 mentally deficient patients. By adding the different groups and some clinical cases with negative blood cases, the incidence of congenital syphilis was 4.9 per cent. In this group the Wassermann reaction was positive in 51, the Meinicke-Kahn in 80.8 per cent. These percentages were found in a mentally deficient population, composed mostly of patients above 16 years of age. In a previous paper, Paddle[4] had studied 402 mentally deficient children and found the incidence of congenital syphilis 9.2 per cent, with positive Wassermann reactions in 67 per cent of this group.

Critical analysis of the literature reveals that the numbers arrived at by various investigators during the last twenty years do not vary to a great extent, and that the differences would be even smaller if several factors were taken into consideration. Too little emphasis has been placed upon the age-factor. For instance, Woodall's study is based upon material of the Walter E. Fernald State School where the admission age of the patients is above six years and the average age above 10 years. Comparison of Paddle's two studies shows that the percentage of positive blood reactions in the adult group is half of that in children. These facts are of great importance.

Our own experience is based on observations at the Wrentham State School, which admits patients below six years of age, starting with babies after birth as far as hospital facilities permit. In the infant group, the more striking pathologic cases are represented: most of the babies and small infants are either cases of Mongolism or those with striking pathologic features. Many of these patients die before they reach an age of sixteen years, dying even before six.

Our autopsy material at the School reveals that among fifty cases only seven idiots were older than seventeen years, most of the autopsies of low-grade feebleminded concerning patients less than fifteen years of age. It is obvious that in any study of mental deficiency and congenital syphilis dealing with patients averaging above sixteen or even above ten years, a large percentage of those suffering from syphilis have dropped out before they reach the test age.

We might summarize the present situation. It is established by previous investigators, first, that positive blood serologic tests may be expected in no more than about fifty per cent of the congenital syphilitic cases among feebleminded persons; second, that the incidence of congenital syphilis in the mentally deficient population as a whole is between 5 and 7 per cent. The percentage of congenital syphilis in mentally deficient infants is much higher, approaching the figure ten. Third, the percentage of congenital syphilis in mental deficiency is lowest in morons, almost equal to that of congenital syphilis in a non-defective population, higher in idiocy, and highest in imbeciles.

For the fact that only about fifty per cent of these cases with congenital syphilis have positive blood findings two main factors

seem to be responsible. First, the fading out of positive reactions to which fact Solomon[1] has called attention as early as 1922. He stated that "there is considerable evidence that the Wassermann reaction in cases of congenital syphilis tends to become negative as time goes on. If one investigates a group of congenital syphilitics during adolescence, the test will be negative in a fair percentage of cases." This observation is stressed by Woodall and again confirmed by our own material. Second, the fact that neurosyphilis is any way associated with negative blood serologic tests in a large percentage.[5] This is established through studies on acquired vascular neurosyphilis and is well recognized for congenital syphilis.

Bronfenbrenner[6] has introduced an interesting idea by postulating a relationship between the mental level and positive blood tests. He thinks of a degenerative phase of syphilis which affects the idiots to a greater extent than the higher grades of mental deficiency. This conception has been termed the "I. Q. gradient of the Wassermann reaction," meaning that the higher the I. Q. the greater the incidence of the positive Wassermann reactions. This fact is supported by our own observations, although the interpretation which we have to offer is different. Among the moron group we found twenty-three cases with positive blood findings, while in the idiot group there were only seven cases. There are 733 morons in the institution and 374 idiots, and one would expect that if the incidence of congenital syphilis were equal in both groups, at least half of the number of twenty-three cases would appear in the idiot group with positive reactions, but instead only one-third of the number was found. Although the imbecile group represents 1034 patients, only ten imbeciles were found with positive blood reactions.

Treatments with mapharsen, thio-bismol, and oral mixed drugs have been given over a period of four to six years by Dr. John H. F. Connor, Assistant Physician, Wrentham State School, and accurate data have been recorded on a selected group of 34 patients. Twenty-one of the 34 cases are on the moron, seven on the imbecile and six on the idiot level. The treatments have been given more or less continuously without the customary rest periods. Periodic blood Hinton examinations have been made on all patients. At the time of writing this paper, ten patients in the moron group, despite continuous treatment, are still serologically positive; five cases in the moron group, after three or more negative findings, are not receiving treatment and continue to show negative tests; three of the moron group have had less than three negative reactions and are being continued on treatment; the remaining three of the group who received no treatment for three years have reverted to positive reactions. Previously they had three or more negative reactions before treatments were suspended. In the imbecile group of 7 treated cases, after four to six years of treatment, 6 remained positive and have at no time shown a negative reaction; one case presented two doubtful results but again reveals positive tests. The last case in this group now shows a doubtful reaction. Among the 6 idiots under treatment three have had three or more negative reactions and treatments have been discontinued. One patient has been continuously positive over a period of six years despite treatment. Another in this group has had two doubtful and one negative reactions, and the last one in this series has had one positive and one negative finding. The two latter cases continue on treatment.

An item of interest is that in the moron group no case with positive tests turned spontaneously into negative reactions. Ten remained positive in spite of treatment and three returned to positive after treatment was discontinued. Of 6 idiots, only one remained positive (general paresis), while the other five had a "recovery" of the blood serologic reaction after the treatment which was without any influence upon their mentality. The case of juvenile paresis which remained positive was primarily not a case of idiocy but that of a high-grade imbecile with an I. Q. of 43 who dropped down to an I. Q. of 17 and was, therefore, included with the idiots.

It is conclusive that in the idiot group the tendency to negative reactions is greater than in the moron group. Idiots admitted to an institution at an older age may show negative reactions in spite of congenital syphilis. Cases of idiocy will easily escape proper

appreciation because of the fact that the parents of these children are likely to withhold information about syphilis and it is impossible to prove the point except by chance of a positive reaction in the child. It is therefore apparent that the proper evaluation of congenital syphilis in idiocy is not obtained through a serologic study of blood, and other sources of information have to be used.

Material and Methods

For the present study the following methods have been used. In an institution, (Wrentham State School) totalling about 2000 patients, all cases which have at present, or had previously, repeatedly positive blood reactions were collected. They will be presented in Group A. From this group were excluded all those cases with only one positive Wassermann or Hinton test and without additional evidence from clinical or family sources available to prove the point. In this way, all cases of mongolism were also excluded in spite of the fact that some authorities consider it a manifestation of congenital syphilis. Mongoloids show frequently positive gold chloride reactions in the spinal fluid as well as positive Wassermann tests. The same experience is reported by Paddle. He discussed the observation of Stevens, who found the Wassermann reaction positive in 30 per cent of mongoloids, and the gold chloride reaction present in 100 per cent. Riddel and Stewart have confirmed Stevens' findings with regard to the property of the spinal fluid of mongoloids to precipitate solutions of colloidal gold in the luetic zone. They examined the fluid of 55 mongoloids and all except one gave a luetic curve. The Wassermann reaction, however, was negative in all cases when properly carried out. It seems, therefore, that some chemical peculiarity of the mongoloid patient is prone to produce that colloidal gold phenomenon which may resemble positive reactions in spite of the fact that they are non-specific. In the unusually large autopsy material of thirty-two cases of mongolism which one of us had the opportunity to study,* no pathologic process suggestive of congenital syphilis was found. Although one cannot deny that under certain conditions syphilis in the parents may facilitate the occurrence of mongolism, this in itself is not a manifestation of congenital syphilis.

In the second group (Group B) all cases are included which have a positive history of syphilis in the parents. The third group (Group C) includes all cases with a negative serologic finding, and no history of syphilis, but with clinical evidence strong enough to make the diagnosis. It is obvious that this group offers great pitfalls and only a thorough comparison of these cases with similar cases of non-syphilitic origin and a necroscopic examination will establish the size of this group. The material is still under investigation. In the fourth group (Group D) those cases will be presented where the post-mortem examination yielded evidence of congenital syphilis.

Chart I—Group A

In Chart I a group of twenty-three morons is reported who had positive blood tests at least on several occasions. Two of the cases do not reveal signs of congenital syphilis although the diagnosis is beyond doubt. In seven cases some neurologic signs were present, hyperactive reflexes being the most common finding. One case had juvenile paresis; twice interstitial keratitis was present; three times paradoxical reactions of the pupils; three times irregular pupils, but thirteen cases had no abnormalities of the eyes. In nine cases the teeth showed either notching or peg-shaping and were rather typical of syphilis. In one case active bone syphilis was present, in one nerve deafness. The I. Q. of these patients ran from 53 to 76, and this group includes some of the brightest patients in the institution. In regard to the age, one was twelve, seven between fifteen and twenty, and the remainder above twenty with the oldest patient aged fifty-five.

The patients in this group have congenital syphilis, but this does not necessarily mean that the mental deficiency is caused by this disease. To investigate this question, all positive information about the families has been collected. This study reveals the rather surprising result that only in one case both parents were mentally superior people, both college graduates. Syphilis was discovered in

(An article on the pathology of mongolism, based on thirty-two autopsies has been submitted to the American Journal of Pathology for publication.)

CHART I—GROUP A

Verified cases of congenital syphilis with positive blood serology (either at present or before.

Morons

No.	Sex	Father	Mother	Siblings	I.Q.	Chron. Age	Blood Serology*	Eyes	Teeth	Neurology	Bones	Clinical Diagnosis
4807	M	Irregular worker	Lues General paresis	1 brother cong. syph.	59 53	16	+	Large pupils iris indistinct	Irregular	Romberg + Tremors + Rigidity Speech defect Psychosis	.....	General paresis
2515	M	Unknown	Sentenced to Sherborn	.....	66 60	30	+—	.....	.....	Rt. club foot Atrophy	.....	Moron
5022	M	Alcoholic Court Records	Mentally defective	2 died 1 def. del. 1 Lyman Sch. 1 f.m. I.Q. 86	65 56	16	+++	.....	.....	.....	.....	Familial Moron
4784	F	Alleged mental case	I. Q. 58 Syphilis 6 illeg. children 2 legitim. children	1 died cong. syphilis 2 died unk. 4 alive ?	56 54	12	—	Paradox reaction	Notched	.....	Ankylosis	Moron (familial)
5429	F	College graduate Highly resp. Syphilis treat.	College graduate Syphilis treat.	1 miscarr. 1 normal	58	21	Now — Had pos. blood and spinal fluid	.....	Defective	Hydrocephaly Epileptic seizures	.....	Congenital syphilis Moron
92	F	Intemperate "Blood Disease"	?	1 younger ?	53 57	55	—	.....	.....	Deafness	Saddle-back nose	Moron
5130	F	Alcoholic	Immoral Degenerate Shiftless	2 older normal 3 younger ment. def.	62 59	18	+	Interstitial keratitis	Peg-shaped	.....	Elbow hypotonic	Moron
3978	F	?	Alcoholic Cerebro-spinal syphilis	Sister I. Q. 64 Pos. Wa.	59 66	32	+	.....	.....	.....	.....	Moron
5371	F	Good reputation	"Capable woman" Syphilis recognized in second pregnancy	2 premature + 1 stillborn 1 died after few weeks 3 younger normal ?	61	23	+	Paradox reaction	.....	.....	.....	Congenital syphilis
5152	F	Drunkard alleged	Sexual. promis. Ment. defect. Syphilis +	2 illeg. 1 retard. 1 ?	66	21	+—	.....	.....	.....	.....	Moron (familial)
4795	F	Alleged	Prostitute	4 illeg.	64	15	+—	Left pupil larger than right	Peg-shaped Hutchinsonian	Hyperactive reflexes	.....	Moron (familial)

4792	F	Charges: Liquor assault	I. Q. 42 Psychosis Taunton	3 f. m. 2 behavior problems 2 unknown	69 65	17	+−	.....	.....	.....	Scaphoid scapulae	Moron (familial)
2284	F	No information	No information	.....	59	34	+	.....	.....	Hyperactive reflexes	Hallux valg.	Moron
2679	F	Intemperate immoral	Intemperate Immoral Feeble-minded (2 sisters at Waverley) Syphilis	3 f. m. brothers Wa +	65 68	32	+	.....	.....	.....	Loose elbow joints	Familial moron
4019	F	alleged laborer with three children	Promiscuous Treated for syphilis	Not known	66	16	++	Ptosis Pupils normal	Deciduous	Hyperactive reflexes	.....	Moron
2394	F	Unknown	Ment. def. Syphilis	Not known	54	34	+	.....	.....	.....	.....	Moron
1678	F	Healthy, little information	Good health	3 older 8 younger (2 died convul.)	63 69	41	+	.....	.....	.....	.....	Moron
3152	M	.....	Tabes dors. Treated Pleasant Refined	No. 1 pre. died No. 2 pre. died No. 3 died at 4 months No. 4 died at 1 year The last two children are living	55 63	24	+	Old keratitis Rt. destroyed Lt. no light reaction	.....	.....	Active bone syphilis on tibia (biopsy)	Moron Congenital syphilis
5209	F	Illiterate Portugese negro	Illiterate Immoral Drinks	2 living 1 died	56 63	21	++	.....	Peg-shaped Deciduous	.....	.....	Moron
3971	F	Laborer	Immoral Ment. infer. Liquor addict	3 younger 1 died	68	24	+	.....	Hutchinson notched	.....	.....	Moron
3872	F	No history	No history	3 died 1 older 1 younger	66	31	+	.....	.....	.....	General infantilism	Moron
4844	F	Irresponsible State Prison for rape of 7 year child Syphilis	Average ? Contracted syphilis from husb.	3	76	17	+	.....	.....	.....	.....	Moron
3148	M	Average intelligence Syphilis	Syphilis Aortitis	7 child. still-born or died at birth 1 living 10 yrs.	64	31	+	Rt. enlarged, fixed Lt. irregular Sluggish reaction opacity	Irregular	Hyperactive reflexes	.....	Congenital syphilis

*Each [illegible] represents a different test, either definitely positive or negative

the pregnant mother and the child developed active signs of this disease in early babyhood. She had hydrocephalus, epileptic seizures and a positive spinal fluid test. She was carefully treated in an outside hospital and the end result was a moron with an I. Q. of 58, who is now twenty-one years of age and has no signs of active syphilis. The blood Wassermann reaction is now constantly negative. In this case we might properly assume that the mental deficiency is due to neurosyphilis in the baby and the parents might have had a normal child if syphilis had not been present.

In the remaining twenty-two cases, the father was unknown six times, alleged three times, an alcoholic addict five times and in only one case reported to be of average mentality. The mother was reported immoral seven times, mentally deficient eight times, addicted to alcohol three times, with active syphilis eleven times. Only three mothers were apparently of normal intelligence. In two cases both parents were unknown. Of all the siblings of our syphilitic morons, only eight were reported normal, four had active signs of syphilis and in the other cases, mental deficiency and criminality were accumulated. The point seems, therefore, well taken that we should be skeptical about the influence of congenital syphilis in the moron group. We might assume that most of these children would have been mentally deficient even without the endowment of congenital syphilis. We might conclude that it is relatively rare that high-grade mental deficiency will result if neurosyphilis is present. The morons with congenital syphilis are similar to morons without syphilis, they represent minus-variations of the population, mostly the product of heredity. Congenital syphilis in this group manifests itself as an infection of the blood with involvement of various tissues but not necessarily of the central nervous system. If neurosyphilis develops the patients do not remain on a moron level. They are prospects of neurosyphilis and have to be treated like patients with acquired syphilis who have positive blood reactions but have not yet developed neurosyphilis. It is still beyond calculation to predict at which percentage neurosyphilis will develop in this group without treatment.

Chart II

In Chart II are represented idiots with present or previous positive serologic findings. In this group there is no case without symptoms, even if we neglect the idiocy for a moment. All showed a varying combination of neuropsychiatric symptoms that prove mental deficiency on an organic basis. Four of the seven patients were ten years old or below. The eighteen-year old patient is a slowly progressive, deteriorating idiot who walks on a broad base and has unequal pupils. The patient twenty years of age is an idiot with progeria, a case very similar to that described as case 2 in a previous publication. An autopsy in that case revealed a very slowly progressive vascular neurosyphilis of the Nissl-Altzheimer type. We might assume that the above case will reveal the same pathologic condition. The patient, aged 26, is somewhat different from the others because here we have a psychotic individual who dropped from an I. Q. of 43 to 17. This case should be properly termed juvenile general paresis.

Comparison of the family history of these patients with that of the moron group reveals the surprising result that in contrast to the poor background of the morons there is not a single case of feeblemindedness in the seven parents of our syphilitic idiots. All of the fathers were of average intelligence, with normal records and none of the mothers showed feeblemindedness, immorality or alcoholic misuse. It seems conclusive that in the cases of idiocy with congenital syphilis the infection is a causative factor of the idiocy, and none of the parents would otherwise have had feebleminded children except for the presence of syphilis. The only means of discovery of the causative factor in these children was the fact that they had positive serologic tests on a few occasions. As pointed out before, in six of the seven the blood turned negative under our own observation and all of these cases would have been seronegative if they had come under our observation at a later date.

Chart III

In the third chart ten cases of imbecility are presented where the diagnosis could be

CHART 2—GROUP A

Verified cases of congenital syphilis.

Idiots

No.	Sex	Father	Mother	Siblings	I.Q.	Chron. Age	Blood Serology	Eyes	Teeth	Neurology	Bones	Clinical Diagnosis
2123	F	History negative	Died Bright's disease	None	43 17 (M.A.2)	26	++++	.....	Under-developed	Hyperactive reflexes	.....	Psychosis
5144	F	History negative	Negative	3 older normal 1 sister died blind	.04	6	+—	Keratitis left Malformed Right scar	.....	Quadriplegia	Microcephaly 17½ cm.	Epilepsy
5281	F	High school Painter Average Negative Hinton	High School Pos. during pregnancy Her father + tert. lues.	1st mac. fem. two younger ? neg.	20	4	+— Spinal fluid + 185 of cells	Pup. reaction slow Strabismus	.....	Hyperactive reflexes Gait shuffling convulsions	Infantile, prominent frontal bones, ostitis long bones	Psychosis Epileptic
4603	F	Machinist Average	2 years high school	3 older married	.06	20	+— ?+—	Oval, left more than right reaction	.....	Overactive, left ankle clonus gait atactic	Progeria	Idiotic Psychosis
3889	M	Average	Poor health	4 more Neg. History	.07	18	+—	Right to left light	.....	Broad base gait idiotic	.....	Idiotic—vitiligo of arms
4847	F	Fireman Good health Average	General health good	4 siblings 1 ment. def. 1 miscarriage	.11	8	+———	Pupils little reaction, iris cloudy	Notched, rippled lower Hutchinson	Hyperactive reflexes, unsteady gait	Scaphoid scapulae	Idiot
4567	F	Laborer Syphilis treated	High School 2 years Housework Syphilis treated	.....	.06	10	— Spinal fluid + lower at 22 ml.	Normal, react to light	Decayed serrated	Quadriplegia Microcephaly Hyperactive reflexes	Brachyceph Microcephaly	Listless Idiotic Epileptic

Remarks: (Case No. 5281)—Treated as baby with chemotherapy and malaria.

CHART 3—GROUP A

Verified cases of congenital syphilis.
Imbeciles

No.	Sex	Father	Mother	Siblings	I.Q.	Chron. Age	Blood Serology	Eyes	Teeth	Neurology	Bones	Clinical Diagnosis
4425	F	Unknown	I. Q. 62 Moron Belchertown (1761) Syphilis	None	29 12 (M.A. const.)	10	—	.....	.....	.....	.....	Psychosis Brain lues
2598	F	Plumber Drunkard Elusive	Immoral Untruthful	Three unknown	34 41	36	++	Blind baby, left eye removed. Rt. interstitial keratitis	Green decayed	Hyperactive reflex tremors	Saddle nose	.....
1437	M	Good health Intemperate for some time	Average ? Little information	?	29 39	34	+++	Reaction sluggish	.....	Paralyzed legs; reflexes absent; left arm shortened; legs shortened	Head large	.....
89	F	Unknown history	Intemperate "Neglect of children"	1 older 1 younger	46	50	++	Rt. pupil asymm. Cornea cloudy	Small	.....	.....	.....
1763	M	Died pneumonia Average	Little information	7 older 1 younger at Wrentham 4 died	35 38	31	+++ ?	Asymm. enlarged	Peggy	Overactive reflexes	Prominent frontal bosses —nose flat	.....
1714	M	Not known Foundling	Not known	.....	41 39	34	+++	Pupils irregular, small, little react.		.....	Genu introrsum Disproportionate large hands	.....
3936	F	Clerk	Died 8 yrs. ago, in child-bearing Average	1 died	34 28 (M.A. const.)	20	+	Keratitis	Poor, irregular peg-shaped	Broad base gait	Hypertelorism Slanting eyes	.....
4815	F	Laborer Colored	Died suddenly of heart attack	3 little information	32	17	++	.....	.....	Tapering fingers Hypotonia	.....	Infantilism
3072	M	Little known Beer drinker	Average	4 older	32	34	+	Left pupil large assym. No reaction Right small	Decayed, black	Hyperactive reflexes Tremors	.....	General paresis Epileptic seizures
4813	F	Negro Coal worker	Promiscuous Syphilis treated 4 illeg. children	2 illeg. from same father	47	13	—	Rt. eccentric Sluggish to light Left normal Strabismus Nystagmus ptosis	Mulberry molar decayed	K. J. hyperactive Abdominals absent	Nose bridge flattened Hypertelorism Scaphoid scapulae	High grade imbecile Cooperative Pleasant
4429	M	Mill worker Syphilis, 1927	Mentally low Syphilis '27	7 born before 1927 retarded	46	11	—	Strabismus	Microdentia notching	Paresis of legs Ataxia	Square type of hydrocephaly —depressed	Imbecile Epilepsy

established beyond doubt. These imbeciles rate clinically between the morons and idiots: the low I. Q.'s (below 35) rank clinically and in their family history with the idiots, while it is a matter of hair-splitting whether the high-grade imbeciles with an I. Q. in the 40's are to be considered as high-grade imbeciles or low-grade morons. The one case with an I. Q. of 46 shows few clinical signs but positive heredity like the morons. On the other hand, the cases with the low I. Q. show positive signs of active neurosyphilis. Twice in this group one finds general paresis. One girl of ten has a psychotic feebleminded mother in another state institution. The child is a rather well-built, intelligent-appearing girl who appears superior to her surroundings but reveals definite signs of psychosis. The other case of general paresis occurred also in a high-grade imbecile who is progressively deteriorating. The other case of high-grade imbecility is again similar to the moron group with a promiscuous syphilitic mother and three illegitimate siblings. The girl is a pleasant, cooperative, high-grade imbecile near the moron border.

Cases with Syphilis in the Mother or in Both Parents, with Negative Sero-Reactions in the Patient

This group is shown in Chart No. IV in which we included only those cases in which a history of syphilis in the mother was beyond doubt. We found seven morons, three imbeciles and one microcephalic patient. The group of morons closely resembles those with positive blood serologic tests, and we are not able to explain why the latter group showed such a strong tendency to positive blood findings while the cases presented in our last chart are sero-negative. Not only in regard to their family background, but also to their clinical manifestations both groups appear to be identical. Of the three imbeciles, one is a familial case, very similar to the moron cases, but the other two show more clinical manifestations suggestive of involvement of the central nervous system by neurosyphilis. One case is a microcephalic, psychologically ranking with the imbeciles but almost on an idiot level.

Patients with Negative History and Negative Blood Tests, but Positive Clinical Signs of Syphilis

It has been mentioned before that this group offers many possibilities for a wrong diagnosis. It is, therefore, beyond the limits of this paper to go into details.

Pathology

A new source of information has been opened through the introduction of a routine autopsy in the institution whenever permission for it was obtained. This permission was granted in about 55 per cent of the total deaths. Autopsies on every type of mentally deficient patient offer the possibility of determining the influence of various factors upon the brain development. Of course, there are several autopsy records published in the literature of interesting cases of congenital malformations of the brain (microcephaly, hydrocephaly, porencephaly, and the like). Congenital syphilis has been studied extensively, but most of the autopsies were performed on babies who died shortly after birth or on individuals with juvenile general paresis, where a long history of ailment had drawn attention to the expected pathologic involvement. Very little is known about the presence of latent neurosyphilis of a vascular type, on congenital grounds. No pathologic studies are available to determine the incidence of congenital syphilis in mental deficiency based on a large autopsy material. The present pathologic report represents only the beginning of such a large scale investigation. Since the opening of the Research Department at the Wrentham State School, seventy-three autopsies have been performed, with histologic studies either completed or under way. By exclusion of mongolism, for reasons given above, fifty autopsies were available in which the question of syphilis has been investigated. In this material, congenital syphilis has been recognized five times (see "pathologic chart).

The pathology of case 1 and 2 was described by one of us (C. B.) in 1940.[7] There is nothing to add about the pathology, but one might say that a more careful study of the family histories and the clinical symp-

CHART 4

Serum-Negative Patients with Syphilis in the Mother.

No.	Sex	Father	Mother	Siblings	I.Q.	Chron. Age	Blood Serology	Eyes	Teeth	Neurology	Bones	Clinical Diagnosis
5446	M	+ lues Court records, larceny, murder, assult, etc. alcoholic	+ lues 2 miscarriages 6 deaths in infancy Court record Illegitimate	1. Sister, congenital syph. treated 2. Brother, congenital syph. treated 3. Sister thought to be luetic	70 63	17	— —	Negative	Poor alignment Serrated edges	Congenital heart Otherwise no physical signs	.....	Undiff. Moron
5009 (Illeg.)	F	Putative father ex-sailor	F.M.; I.Q. 47 Lewd, lascivious Reformatory & Bridgewater + lues 1931 also gonorrhea	?aunt ?sister F. M. Pt. at WSS No. 1716	60 45 47	19	—	Pupils large	Upper right laterals "chipped"	Prominent frontal bosses Active K. J.'s	.....	Familial Moron
5268	F	"Venereal disease" in 1917 treated Arrested t. b. case	"Venereal disease" in 1917, treat. Much abdom. and pelvic surgery	1 premature (died) 1 infant died 2 miscarriages 1 illeg. bro. 2 bro. truant, larceny	84 58 59	18	— —	Pupils 'large'	Poor occlusion Crowded alignment Underdeveloped lower jaw	Sluggish K. J.'s	See "Remarks"	Undiff. Moron
5288	F	Court records Jail sentence	+ lues, 1929	1 stillborn 2 deaths shortly after birth 1 bro. delinquent (Reform.)	46 42 47	12	—	Convergent strabismus	Irregular, crowded Alignment "mottled"	"Pugged" nose, ataxic (festination gait) "Diminished hearing" Defective speech, Hyperactive K. J.'s and A. J.'s Bilat. Babinski and Hoffman	.....	With other organic nervous disorders (Pyramidal tract involv.) Imbecile
4624	M	Alcoholic Drunkard	Delinquent at age 12 Promiscuous, G. C. Lues, 1933	1 illeg., 1927	32 28	14	— —	Left pupil larger than right; rt. internal strabismus	Erosion of posteriors, Abnormal occlusion Abnormal maxillary relations		Scaphoid scapulae Oxycephaly Microcephaly	With develop. cran. anom. Microcephaly Imbecile

4255	F	Unknown Stepfather is luetic and F. M.	Lues with treatment F. M.	1 stepsister (no history)	64 58	20	—	Sluggish to L & C	Negative	See "eyes"	Dorsal scoliosis (Para vertebral abscess T. B. myelitis)	Familial Moron
4965	F	Unknown	F. M. promiscuous Criminal record + lues. Died in Tewksbury, 1935.	7 illeg. siblings	45 49	20	—	Bilateral upper lid ptosis	Negative	"Defective speech"	Scaphoid scapulae Sabre shins Scaphoid brows	Undiff. Imbecile
4930	F	Alleged father Court records larceny, assault, served time		1 Juvenile Research 1 died in 1930, age 8 mos. 1 died in 1936, age 1 mo.	55 55	21	—	Dilated pupils	Poor occlusion Abnormal maxillary relations	"Negative"	Narrow brow Scaphoid scapulae	Familial Moron
4942	F	Deaf-Mute (spinal meningitis)—rape incest—state prison also state hospital + Kahn + Hinton	Deaf-Mute	1 illeg. 3 siblings negative	54 52 51	16	—	Bilateral ptosis left internal strabismus	Poor occlusion Irregular alignment	"Waddling gait" "Defective speech" "Active reflexes"	Nasal brow Lumbar lordosis—Convex scapulae	Undiff. Moron
4858	M	Lues with treatment. Died 1932 of T. B. (War Veteran)	F. M. tertiary lues with treatment	1 illeg. (luetic) 1 lues 1 died, 27 days 1 died (lues) 1 died, 22 days	38 45	19	—	Negative	Poor occlusion	"Fair coordination" "Hypotonus"	Scaphoid scapulae—prognathic jaw—nasal brow	"Post infectional congenital syphilis" Imbecile
5294	M	Negative	Promiscuous lues with treatment Mother's sister "paralyzed" Mother's cousin Monson St. Hospital	1 illeg. 1 died convuls. 1 F. M. 1 idiot 1 convulsions "Some" miscarriages	50 54	12	—	Astigmatic Nystagmus Irregular pupils Sluggish to L & D Strabismus	Discolored Fair occlusion	See "Eyes"	.....	Familial Moron

Remarks: (Case No. 5268)—Pt. had G. C. on admission to WSS. Bowed legs.

(Case No. 5288)—Has twin brother.

(Case No. 5294)—Asymmetric facies.

toms would have suggested the possibility of congenital syphilis. As a matter of fact, the pathologic findings are not surprising to anyone familiar with the problems of neurosyphilis. One point especially merits consideration. Case 1 was admitted to a hospital two weeks after birth showing acute signs of basal meningitis. A Wassermann test proved negative, on account of which syphilis was ruled out.

Jeans and Cooke[5] emphasize that: "syphilitic infants not unfrequently have negative Wassermann reactions at birth while later tests on them are strongly positive. This may be interpreted to mean that in certain infants, possibly those infected relatively late in pregnancy, the substances giving positive Wassermann reaction are not formed until a certain time has elapsed from the initial infection * * * In order to exclude congenital syphilis in an untreated infant, a negative Wassermann reaction must be obtained after the age of two months. If antisyphilitic treatment is given before the Wassermann reaction becomes positive, the reaction may never become positive, or, if insufficient treatment is given, the development of the reaction may be delayed for several months." The authors demonstrate this experience in several case histories. We think that owing to the circumstance that the only Wassermann test was made in our case so early after birth it led to a wrong diagnosis and has kept later investigators away from a proper evaluation of the clinical data.

Another case of our material gives a startling demonstration of the pitfalls in the diagnosis of congenital syphilis. A little girl, aged one, was brought by her mother to a hospital "because of failure to develop normally." The mother stated that she had one stillborn baby at eight months and that this

PATHOLOGY CHART

Autopsy No.	*Age at Time of Death*	*I. Q.*	*Family History*	*Blood Serology*	*Clinical Symptoms*	*Autopsy Findings*
37/2	8-11/12	59	Non-contributory	Negative	Prematurity Meningitis two weeks after birth Strabismus, opisthotonus Spasticity of legs Sluggish pupillary reaction Increased knee jerks Epilepsy	Meningo-vascular syphilis Heubner's endarteritis
38/28	16	22	Mother syphilitic	Negative	Nystagmus Strabismus Pupillary reactions sluggish Snuff fundi Progeria General rigidity Epileptic seizures	Meningo-vascular syphilis Nissl-Alzheimer endarteritis
40/53	32	68	Mother syphilitic & subnormal	Negative	Moron Cardiac disease	No signs of neurosyphilis
41/68	19-1/12	22	Non-contributory	Positive; spinal fluid++++	Juvenile general paresis	General paresis Meningo-vascular infiltrations Tabes dorsalis
41/70	33-2/12	43	Mother syphilitic Two siblings premature, four died	Negative	Convulsions in infancy "Brain fever" at age of three Unequal pupils Teeth serrated Interstitial keratitis at the age of fifteen	Developmental anomalies Status dysrhaphicus

second child was a full-term baby, following difficult delivery. "Family history negative; both parents are said to be healthy." Physical examination revealed a chubby infant, color poor, head appeared large, with frontal prominences. Anterior fontanelle large, tense, measuring two inches; contracted pupils, which reacted sluggishly to light. Fundi showed bilateral haziness of the discs, with occasional spots of chorioretinitis. Bilateral, poorly sustained ankle clonus; Kernig and Babinski signs negative. Lumbar puncture showed total-protein of 63 mg. per cent, 184 mono-nuclear cells. "X-rays of the long bones suspicious of syphilis." When the mother was called, she admitted, in face of all the evidence, that she had a positive Hinton test and that she had had treatment during the last month of pregnancy, when the positive reaction was discovered at a prenatal clinic. Further investigation showed that the mother had taken the baby to a clinic three months after birth, requesting a blood Wassermann, which was negative. Without taking into consideration that the blood was negative probably because the mother had had treatment the last month before delivery which delayed the appearance of a positive blood finding, the case was dismissed: "baby not syphilitic." One month after successful treatment of the baby for four months in the hospital which discovered the congenital syphilis, the mother went back to the first hospital and presenting the negative Wassermann test, and withholding all information about the four months of treatment for congenital syphilis, the baby received now the diagnosis "birth injury with brain defect." A further study of the case history revealed that the mother knew for four years that she had syphilis. The first stillborn was a macerated baby.

The fourth case on the pathology chart is another of neurosyphilis which came recently to autopsy. A brief description may be added to the two previous case records. This patient was discovered as being syphilitic since the age of fourteen. At that time he was an energetic boy with a fair vocabulary and an I. Q. of 49, having a mental age of 6 10/12 years. He did not show neurologic symptoms except that his movements appeared somewhat clumsy and his gait was awkward. His Hinton test was strongly positive. He was given a course of chemotherapy. After several months it was noticed that his gait became increasingly unsteady, and he walked on a broad, flat base. There was absence of deep reflexes and a bilateral Babinski sign was observed. During the next year he became increasingly unsteady and mental deterioration was noticed. His I. Q. dropped eventually to 22. After four years he was so unsteady that he fell frequently and finally was bedridden for the rest of his life, about one year before his death. At that time his knees and hip joints were bent and rigid. The pathologic examination revealed grayish cloudy leptomeninges which were thickened and measured more than 2 mm. in several regions. The cortical convolutions were greatly atrophic. On frontal sections a large hydrocephalus internus was discovered, the lateral ventricles measuring two inches in the vertical and 1¼ inches in the horizontal diameter. The tissue around the vessels was greatly atrophied and the perivascular spaces were filled with a grayish meshwork which looked, in the gross specimen, like spider webs. The microscopic examination revealed lymphocytic infiltrations in the pia and perivascular cuffing all over the cortex. The nerve cells showed degeneration and disorganization of the architecture. The glia was increased and many rod-cells were present. The Turnbull's iron reaction was positive and showed iron deposits around the capillaries and within some glia cells. The caudate nucleus and the basal ganglia were atrophic and greatly reduced in size. In the spinal cord there was little evidence of spinal meningitis, but a few vessels showed endarteritis of the Heubner type. The posterior roots, especially the Burdach tract were degenerated, but the lateral pyramidal tracts showed also marked demyelination. In spite of the long duration of the illness, the lesion of the brain suggested a very acute process. Spirochete stains, in several sections of the brain, were negative.

Case three is that of a high-grade moron who died of tuberculosis. She belongs in our Group B of patients with a positive family history but no indication of neurosyphilis. Careful post-mortem examination did not reveal a condition which could be attributed to a syphilitic process in the brain.

Case five is that of an imbecile with a posi-

tive family history and negative blood reactions. In this case examination of the spinal cord revealed a malformation of a dysrhaphic type. The brain was simple, showed broad convolutions and the ventricles were slightly enlarged. There were no focal lesions recognizable. The microscopic examination of the case is not yet completed.

From the point of view of pathology, the effect of congenital syphilis in mental deficiency may manifest itself in three ways:

1. Morons with congenital syphilis, but no signs of neurosyphilis (Case 3).
2. Imbeciles and idiots with active signs of neurosyphilis (Cases 1, 2, 4).
3. Patients with congenital malformations but no signs of active neurosyphilis in later life (Case 5).

In regard to the first group, the pathologic study seems to confirm the clinical observations that in the moron group with congenital syphilis, the mental deficiency is caused more by yet unknown hereditary factors than syphilitic deterioration. In the second group neurosyphilis is present. It is essentially similar to neurosyphilis which follows acquired syphilis. These cases are not ones of stationary mental deficiency, but of progressive deterioration and varying neurologic symptoms. Between thirty and forty per cent of the children with congenital syphilis reveal involvement of the central nervous system. The last group of congenital malformations ascribable to congenital syphilis offers the most difficulties for proper evaluation. It has always been a postulate that syphilis of the parents might affect the offspring in such a way that congenital malformations of the brain result. Thom[9] states that "syphilis of the parents may so affect the germ cells, not perhaps by the spirochete itself but by the toxins generated by them, as to cause a molecular disturbance or possibly a chemical change, thus from the very beginning debilitating the germ plasm and retarding its development, or causing it to develop abnormally, and yet there is no infection and the Wassermann is negative." Although this might be true, it is almost impossible for the pathologist to prove that a malformation is attributable to congenital syphilis. Microcephaly and various malformations may well occur without syphilis and there are no means of determining the cases in which syphilis is a causative factor. In our autopsy material, there are at least five cases of undifferentiated idiocy where brain degeneration, increased perivascular gliosis, fibrotic leptomeningeal proliferation, ependymitis grandulosa and slight hydrocephalus internus were found. These cases appear to be similar to those of neurosyphilis in which the lymphatic infiltration of the tissue has disappeared and only degenerative, sclerotic processes remain. In the absence of a positive serologic reaction or positive history, it is impossible at present to properly classify these cases.

Conclusions

Congenital syphilis is present in about six to seven per cent of the feebleminded population. Not in all of these cases is syphilis the cause of mental deficiency. Our material indicates that in a large percentage of morons no signs of neurosyphilis are present. Family studies revealed the presence of hereditary factors in most of these patients. Congenital syphilitic imbeciles and especially idiots gave evidence of neurosyphilis in the majority, and the material indicates that in these cases the mental deficiency is the result of the destructive process of neurosyphilis. It seems that nearly forty per cent of the patients with congenital syphilis develop signs of neurosyphilis and mental symptoms. Our material revealed some peculiarities which appear hard to explain at first sight. A study of the heredity of syphilitic idiots showed little evidence of mental deficiency in the parents. In this respect the difference between the morons on one side and the low-grade imbeciles and idiots on the other side is striking. Does this mean that neurosyphilis is more likely to develop in children with no heredity or vice versa, and are the familial morons more protected against the development of neurosyphilis than children of normal parents? It is easy to slide into a number of speculative explanations for this fact. One might say that the better differentiated brain of normal children is more susceptible than the less developed brain of familial morons. A less speculative answer, however, would be more adequate and is suggested through another line of observations. It has been shown that the blood serology tends to fade out in the

lower mental group while many of the higher grade morons show persistent positive blood reactions, in spite of repeated treatment. This seems consistent with the explanation that persons with strong antibody formation are less liable to develop neurosyphilis than those with little resistance. This would suggest that neurosyphilis develops in those children with little antibody formation and little signs of syphilis in other organs, a postulate which is repeatedly emphasized by various investigators as explanation of the fact that in acquired syphilis only a certain percentage of the patients develop neurosyphilis.

The fact that we have so few imbeciles and idiots coming from mentally inferior parents may be explained by the fact that the mortality in this group is much higher than in the more intelligent families. As to the death rate in syphilitic families, there is some disagreement in the literature. Solomon,[1] who dealt with this question in 1922, quotes several statistics of other investigators which indicate a rather high mortality in syphilitic children. He himself, however, concludes from his own findings: "that the infant death rate from syphilis is not abnormally high." He found twenty per cent of the children who had been born alive had died. Jeans and Cooke,[8] who re-examined this problem in 1930, show that if the method of selection was the incidence of a child-death due to syphilis, a study of the families revealed that fifty-nine per cent of the children born had died. In families reported by still births in which syphilis had been diagnosed, eighty-one per cent of all of the children born had died. The authors completed several investigations by studying the family history of syphilitic children. In one study 104 of 337 living births in 100 syphilitic families had died (30%). In another study of 200 living births 25 per cent had died. In totalling several reports of their own and those of other investigators they found 27 per cent of children of 3391 living births in syphilitic families to have died. "The great majority of these were infant deaths."

Without expecting much from a calculation of our own material, we counted the deaths of siblings of our syphilitic morons and found that twenty-one of the eighty reported living births had died, which represents 27.6 per cent. Although covering only a small number of cases, the number is well in line with the reported statistic of Jeans and Cooks.[8] It is therefore safe to state that a considerable number of all syphilitic infants die before they are admitted to any institution. A study of congenital syphilis based on an institutional material like ours does, therefore, not reveal the whole effect of congenital syphilis upon the central nervous system in the offspring. This is further confirmed by the statement of Dennie[10] that thirty-nine per cent of children with syphilitic meningitis die.

Mental deterioration on the grounds of congenital syphilis is present in forty to fifty per cent of the feebleminded patients with congenital syphilis. Although a percentage of five to seven of congenital syphilis in the mentally deficient population does not appear alarming, the importance of congenital syphilis for the production of mental deficiency becomes conspicuous when the groups of imbeciles and idiots are studied separately from the moron. According to Tredgold's[11] statistics, one might expect one idiot in 5000 persons, one imbecile in 1500 persons, while the whole incidence of mental deficiency is one in 250-400 persons. According to our calculation, among 1000 mentally deficient persons, there are about 100-150 imbeciles and idiots. Among 1000 feeble-minded persons with congenital syphilis, more than 400 are on the level of imbecility and idiocy. Among twenty-five autopsies of undifferentiated imbeciles and idiots we found three with neurosyphilis.

This calculation does not include those cases where mental deficiency is ascribable to a congenital malformation which is resting or slowly degenerative and where no residuals of syphilis are present at autopsy.

References

1 Harry C. Solomon: *Syphilis of the Innocent*, Washington, 1922, United States Interdepartmental Social Hygiene Board.

2 Dayton, Neil A.: "Congenital Syphilis as a Cause of Mental Deficiency," *Boston Med. & Surg. Journ.*, 193:668, 1925.

3 Woodall, Chas. S.: "The Incidence of Congenital Syphilis in an Institution for the Feebleminded," *Amer. Assoc. Study Feeblem.*, 1929:233.

4 Paddle, K. C.: "Congenital Syphilis in Mentally Defective Adults," *The Journ. Neurol. Psychopath.*, 15:147, 1934.

4a. Paddle, K. C.: "Congenital Syphilis in low-grade mentally defective children," *Brit. Journ. Child. Dis.*, 30:249, 1933.

5 Solomon, H. C. and Klander, Joseph V.: "Neu-

rosyphilis with negative Spinal Fluid," *Journ. A. M. A.*, 7:1701-1706, Nov. 26, 1921.
6 Bronfenbrenner, A. N.: "The Wassermann Test in the Feebleminded," *Psychiatr. Quarterly*, 5:45, 1931.
7 Benda, Clemens E.: "Syphilis in Serum Negative Feebleminded Children," *Americ. Jour. Psychiat.*, 96:1295, 1940.
8 Jeans, Philip C. and Cooke, Jean V.: "Prepubescent Syphilis," *D. Appleton & Co.*, 1930.
9 Thom., P. B.: "Syphilis and Degeneration," *Journ. Nerv. Dis.*, 53:8, 1921.
10 Dennie, Charles C.: "Syphilis," *Harper & Bros. Publishers*, 1928.
11 Tredgold, A. F.: "Mental Deficiency," *William Wood & Co.*, 1929.

The Relative Efficacy of Various Methods of Treating General Paresis

WILLIAM FREEMAN, M.D.*
Worcester, Massachusetts

Dr. Freeman is Instructor in Pathology at Boston University School of Medicine; Pathologist to the Memorial Foundation for Neuro-Endocrine Research, the Worcester State Hospital, and the Worcester Hahnemann Hospital. He is a member of the American Association of Pathologists and Bacteriologists, the American Society of Clinical Pathologists, the American Association for the Study of Internal Secretions, and a Fellow of the American College of Physicians, and a Diplomate of the American Board of Pathology.

The specific treatment of general paresis has undergone notable modifications during the 30 years since Ehrlich's epochal discovery of "606", or salvarsan. Prior to 1924, the effective mode of therapy for this disease was with the chemicals mercury, bismuth, iodine, and the arsenicals, along with the now obsolete "Swift-Ellis" treatment. About 1924, malarial inoculations became popular as a therapeutic agent, and about 1929, artificially induced fever came into being. Since these signal additions to the armamentarium of therapy have now been employed over a considerable number of years, an appraisal of their results would seem to be warranted.

Up to the present no reports have been available indicating just what the decrease in the death rate has been in this disease, if any, or what the increase in the discharged-improved rate has been, if any. On the other hand, fever therapy, either by parasitic inoculation or by artificial means, is a time-consuming and expensive method of treatment, and its use can be justified only by the criterion of a lowered death rate or a higher discharged-improved rate. Furthermore, the practicability of improving results with present methods offers another basis for inquiry. It is with this stock-taking in mind that the following study was made.

The study is based on 840 general paretic patients consecutively admitted to the Worcester State Hospital during the 20 years from January 1, 1920, to December 31, 1940, inclusively. Patients transferred to other institutions before residing here a minimum of three years were rejected for this investigation. General paretics only were considered; patients diagnosed as tabetics, tabo-paretics, or psychotics with meningovascular syphilis were not included. Furthermore, since preliminary work on men and women separately showed like results, division as to sex was not deemed essential in the final study.

The composition of the group is detailed in Table I, where it is divided in terms of calendar-year periods and according to age on hospital admission and proportion of women patients. The beginning of each period represents a transition in the specific treatment of choice at this hospital. The details of these changes in therapy are discussed in the paper.

TABLE I

ANALYSIS OF THE GROUP STUDIED

Calendar Year Period	*Number of Patients*	*Per Cent Admitted Less Than 40 Years of Age*	*Per Cent Admitted Between 40 to 50 Years of Age*	*Per Cent Admitted Between 50 to 60 Years of Age*	*Per Cent Admitted 60 Years of Age or Over*	*Per Cent Women Patients*
1920-'24	177	32.2	36.7	22.6	8.5	17.5
1925-'29	195	33.3	40.0	17.9	8.7	24.6
1930-'40	468	36.2	32.5	23.4	7.5	22.4
Totals	840	34.7	35.1	22.3	8.0	21.9

It is to be noted that the age distributions are virtually the same throughout the twenty

* From the Worcester State Hospital.

years reviewed. However, whether or not the onset of the psychosis now occurs earlier or later in life is not brought out in this table. It is also to be noted that men are hospitalized about five times more frequently than women.

Table II analyzes the proportion of patients

TABLE II
ANALYSIS OF THE GROUP AS TO TREATMENT GIVEN FOR EACH CALENDAR PERIOD

Calendar Year Period	*Number of Patients Admitted*	*Per Cent Treated by "O" Method*	*Per Cent Treated by "A" Method*	*Per Cent Treated by "M" Method*	*Per Cent Treated by "D" Method*
1920-'24	177	37.8	62.2	0	0
1925-'29	195	14.9	12.8	72.4	0
1930-'40	468	17.7	18.1	0	64.2
Totals	840				
1937-'40	129	8.5	18.6	0	72.8

treated by the various forms of therapy during each calendar-year period. The "O" therapy group received no specific treatment of any kind. The patients in this category were those, in the opinion of the clinical staff, whose physical condition would not enable them to tolerate active therapy. In other words, they represent the physical wrecks among the general paretics newly admitted to the hospital. The figures in this group reveal a most interesting fact in that the proportion of physical wrecks has decreased since 1924 from 37.8 per cent to 17.7 per cent in the 1930-1940 period. If we further scrutinize the latter group, we find that since 1937 only 8.5 per cent of the admissions were thus classed. This situation must be a result of something that has taken place before the patients entered the hospital. Its significance is important for a reduction of almost 30 per cent has been effected in the number of physical wrecks entering the hospital with general paresis. An investigation would certainly be warranted to determine the actual agent or agents responsible for this development. If it should be found that the increasingly earlier application of antiluetic treatment were the cause, an impressive argument would be obtained for intensive treatment when syphilis is first contracted.

"A" therapy refers to specific chemicals only, such as the arsephenamines, the tryparsamides, bismuth, mercury, and the iodides. Usually treatment was not limited to one chemical agent alone; two or more were administered alternately. From 1920 to 1924 chemotherapy was the only form of specific management used for this disease in this institution, hence 62.2 per cent of the patients admitted during that period were treated by this method.

From 1925 to 1929, inclusively, malarial inoculations (denoted by "M" in Table II) became the specific therapy of choice. These were not used by themselves, however, but in conjunction with specific chemicals given in alternate treatment periods. During these years 12.8 per cent of the patients admitted were physically unable to stand fever therapy but able to tolerate specific chemotherapy alone, and therefore were given the "A" type of treatment; while 14.9 per cent of the group were in such poor physical condition as to be considered bad risks for any specific treatment at all and consequently were treated by the "O" method.

In 1930, malarial inoculations were discontinued in favor of diathermy as the specific therapy of choice ("D" in Table II). As with the former method various combinations of specific chemotherapy were administered during the intervals between diathermy applications. Elaboration of the technic is presented by Barton *et al* in another section of this symposium. The data of the 1930-1940 decade show that 18.1 per cent of the patients were selected for the "A" form of therapy alone, while 17.7 per cent received the "O" treatment.

Results

So far the facts offered for consideration have been mostly of a descriptive nature. In Figure 1 the results obtained by the various types of therapy are examined. They are divided into three categories: (1) the percentage of patients who died while in the hospital, (2) the percentage who were not improved, and (3) the percentage who were discharged as improved. The group designated "not improved" consists of those who either remained hospitalized or were unable

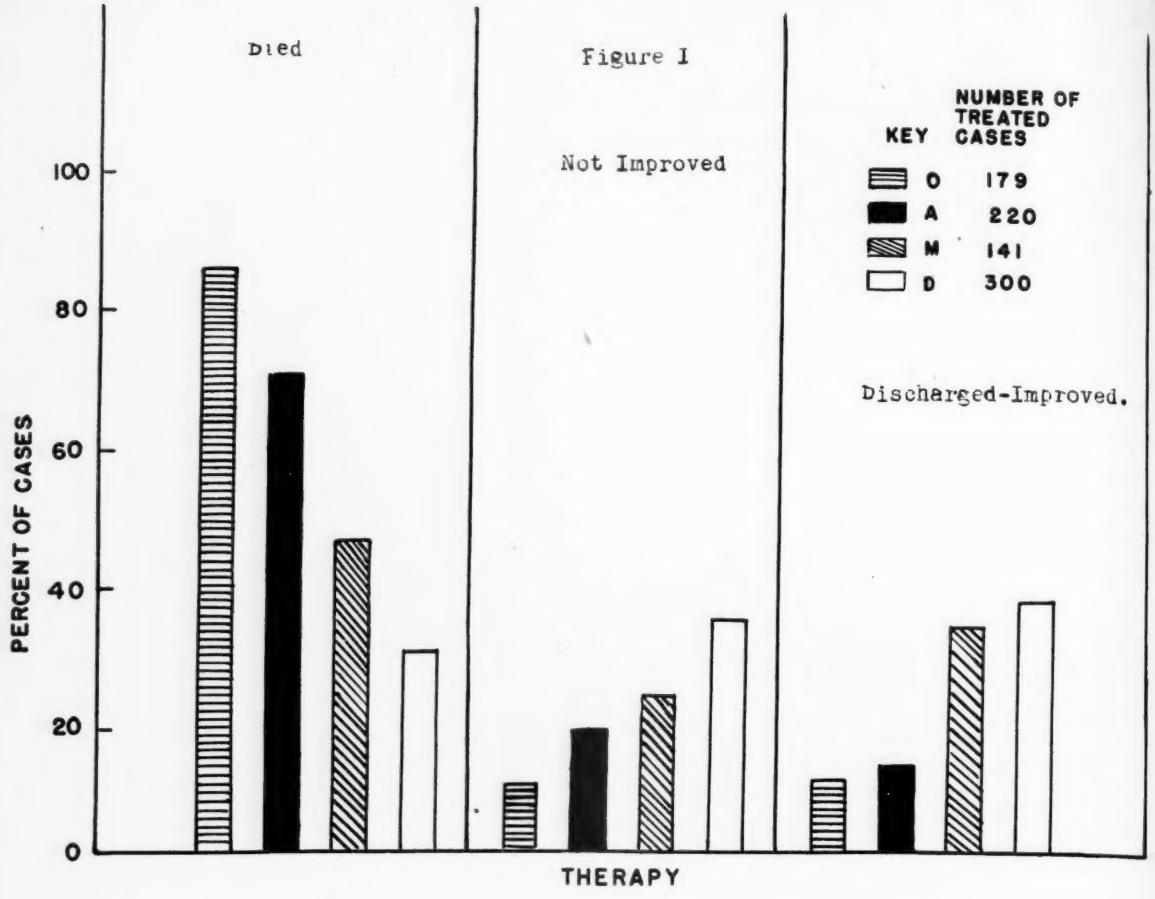


Figure I

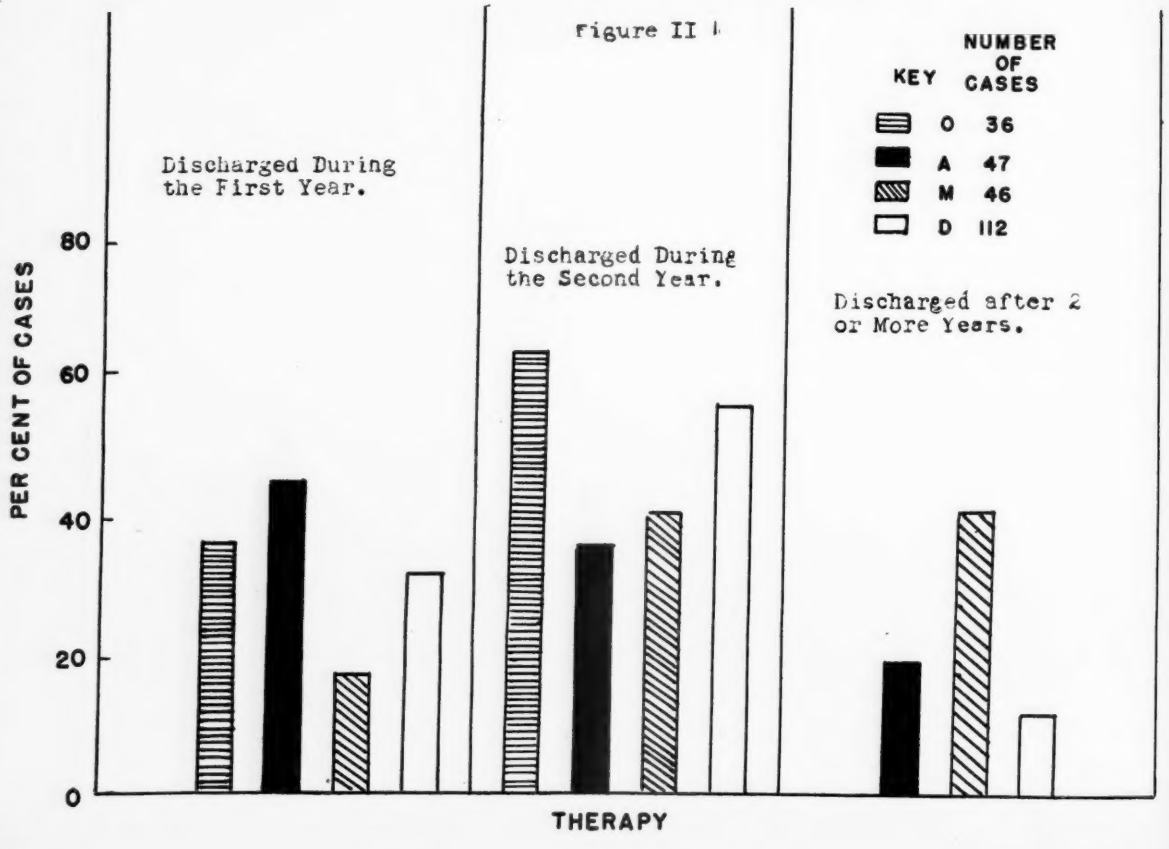


Figure II

to take care of themselves even though they were discharged from the institution. The group designated discharged-improved concerns those who were discharged from the hospital and were able to look after themselves without supervision or nursing care, even though they did not necessarily resume their mode of life at the same economic or intellectual level as preceded their psychosis.

It is to be noted that, at this hospital at least, the "D" treatment results in the lowest death rate and in the highest discharged-improved rate. Even more remarkable is the fact that the mortality rate dropped 55.7 per cent with this form of therapy while the discharged-improved rate increased 26.3 per cent. Moreover, it is consistent with fact to suspect that the discharged-improved figure of 37.4 per cent for the "D" treated group is not conclusive since, it must be remembered, the patients in this group were admitted up to January 1, 1941, or less than a year ago, and as is brought out in Figure 2, at least two years of "D" treatment are required to result in 88 per cent of the group being discharged as improved, while in 12 per cent even longer than two years is required. Therefore, we may reasonably expect by January 1, 1944, a number of discharged-improved cases from the 34 per cent non-improved at this writing.

Figure 2 is an analysis of the duration of hospital treatment in the discharged-improved cases with reference to the type of treatment received. Patients under "A" treatment are shown to make up the largest proportion, 44.7 per cent, of those discharged with a year or less of treatment. Thus it would seem that when chemotherapy is effective in the treatment of general paresis, it exerts its beneficial results earlier than any other agent in our hands. The "D" treatment yields the next largest proportion of cases discharged-improved after a year or less of treatment. On the other hand, it can be noted that 88 per cent of this discharged-improved group treated by the "D" method were discharged before the end of two years, a result not equalled by the "A" treated group in a similar period.

It is also remarkable that not only does the "D" form of therapy have a lower death rate than the "M" form, and not only is the discharged-improved rate higher with the "D" group than with the "M" group, but in addition, the duration of hospital treatment is shorter in those who were discharged as improved. In other words, in our hands, the "D" treatment is less fatal, more curative, and quicker of beneficial response than the "M" form of therapy.

Analysis of the hospitalization period of those who died in the hospital, Figure 3, brings out the fact that the lowest number of deaths during the first year occurred in the "A" treated group. Of course, it is obvious from the figure that the "O" treated group has the least chance of improvement and the greatest of dying.

Thus the evidence presented in this detailed investigation indubitably demonstrates that the treatment of the general paretic patient IS worthwhile. The death rate has dropped from 84.4 per cent to 28.7 per cent, a gain of 55.7 per cent of the lives. The discharged-improved rate has risen from 11.1 per cent to 37.4 per cent, a gain of 26.3 per cent in rehabilitation, with the promise of an even larger proportion to be achieved within a few years. The question now arises whether these figures can be improved with the means now employed.

It has already been seen in Figures 2 and 3 that chemotherapy alone results in the highest discharged-improved rate and the lowest death rate during the first year of hospital treatment. In a study of the comparative results obtained by each form of therapy during the various decades of life, Figures 4 to 7, inclusively, it is found that the death rate is less regardless of age, in those patients

---

LEGENDS

FIGURE 1
Comparative results of treatment.

FIGURE 2
Comparison of the duration of hospital treatment of the discharged-improved cases.

FIGURE 3
Comparison of the deaths which occurred in the hospital and the duration of hospital treatment.

FIGURE 4
Comparison of the results of treatment of patients under 40 years of age.

FIGURE 5
Comparison of the results of treatment of patients between 40 and 50 years of age.

FIGURE 6
Comparison of the results of treatment of patients between 50 and 60 years of age.

FIGURE 7
Comparison of the results of treatment of patients 60 years of age or older.

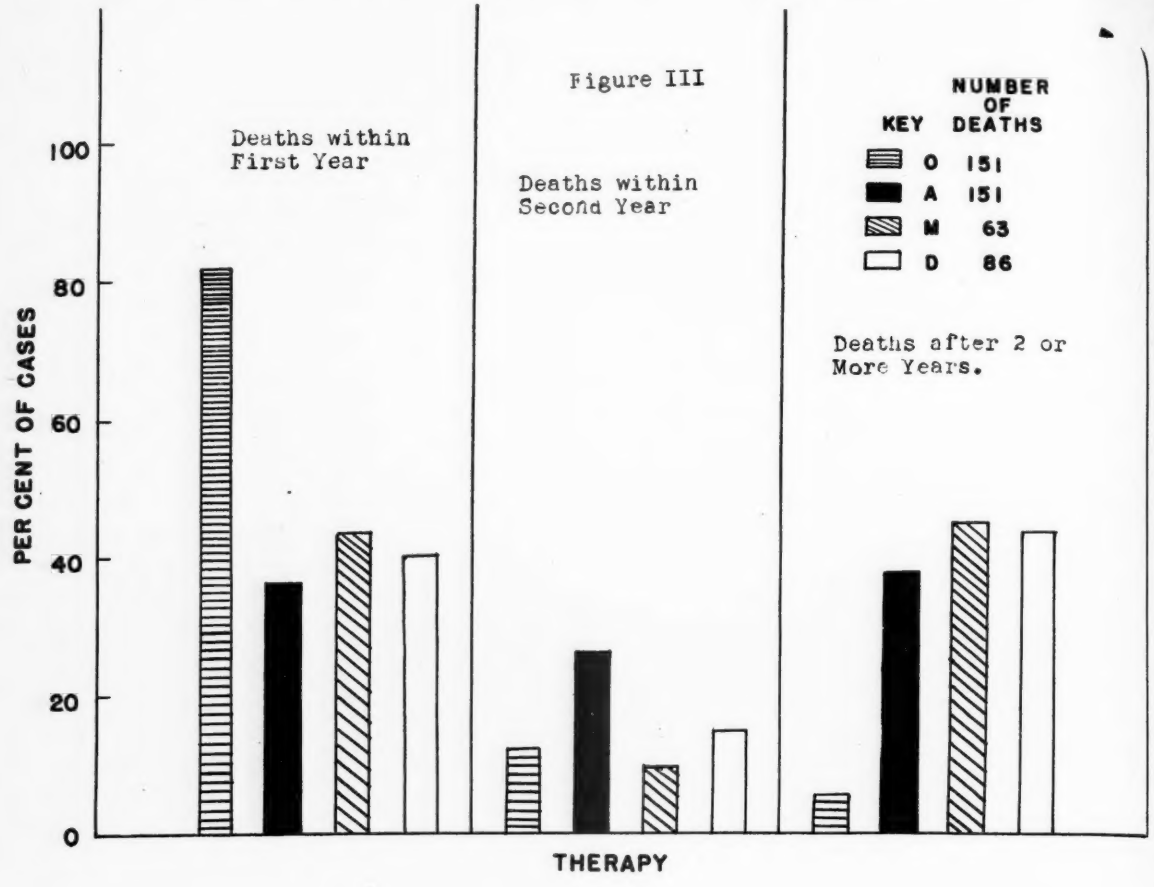


Figure III
Deaths within First Year
Deaths within Second Year
Deaths after 2 or More Years.
KEY
NUMBER OF DEATHS
O 151
A 151
M 63
D 86
PER CENT OF CASES
100
80
60
40
20
0
THERAPY

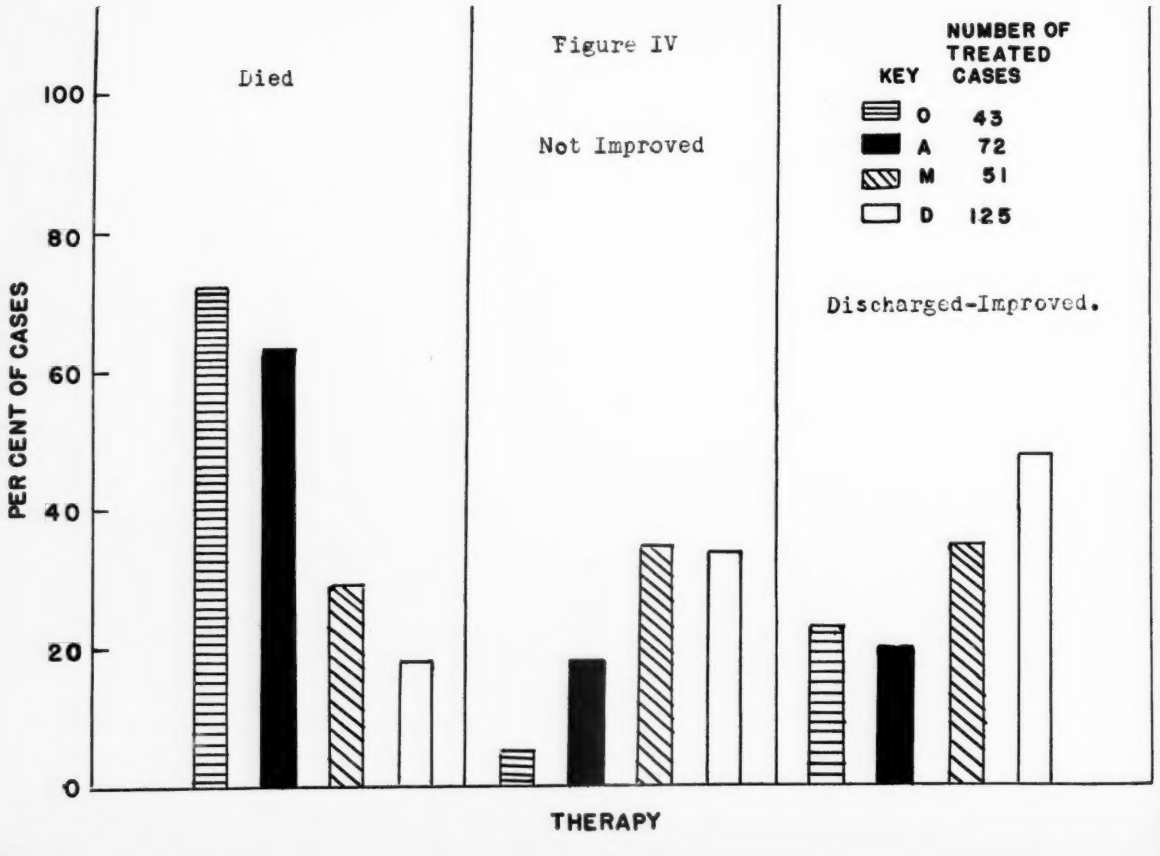


Figure IV
Died
Not Improved
Discharged-Improved.
KEY
NUMBER OF TREATED CASES
O 43
A 72
M 51
D 125
PER CENT OF CASES
100
80
60
40
20
0
THERAPY

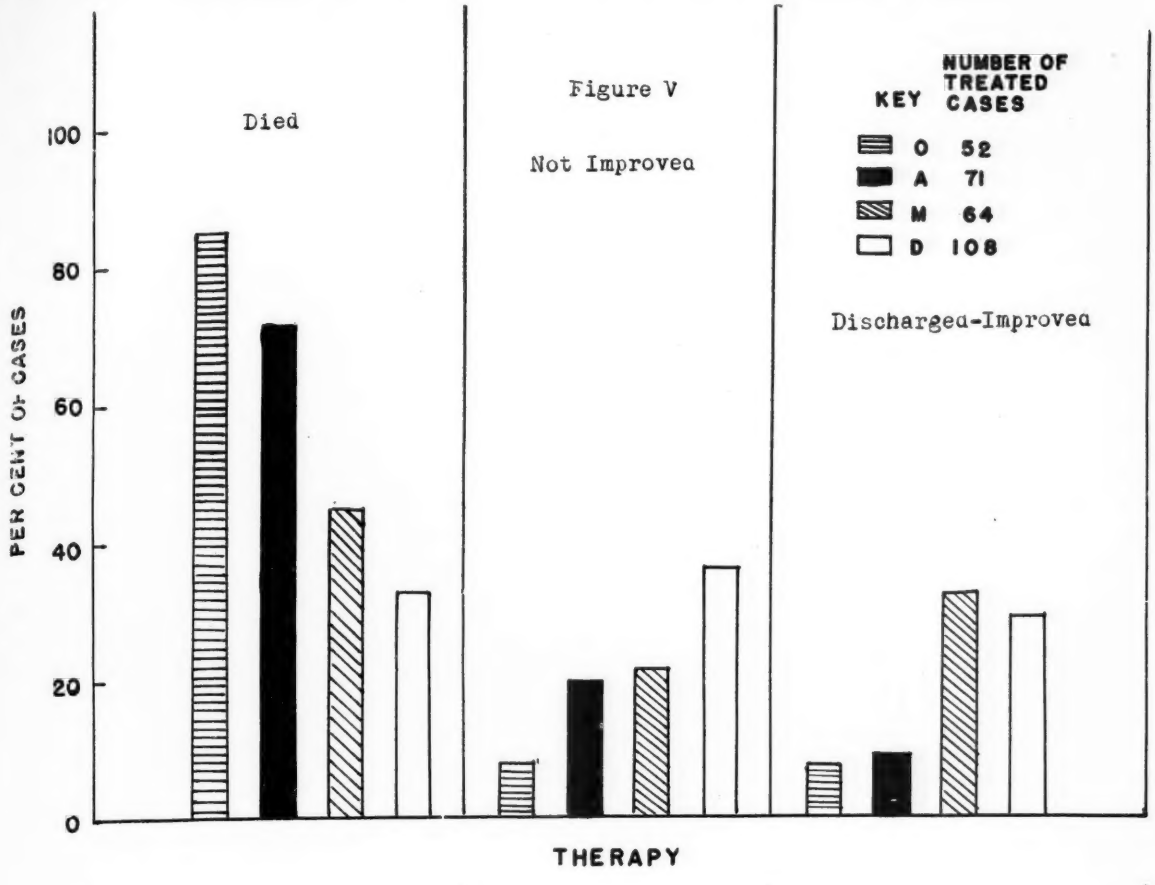


Figure V

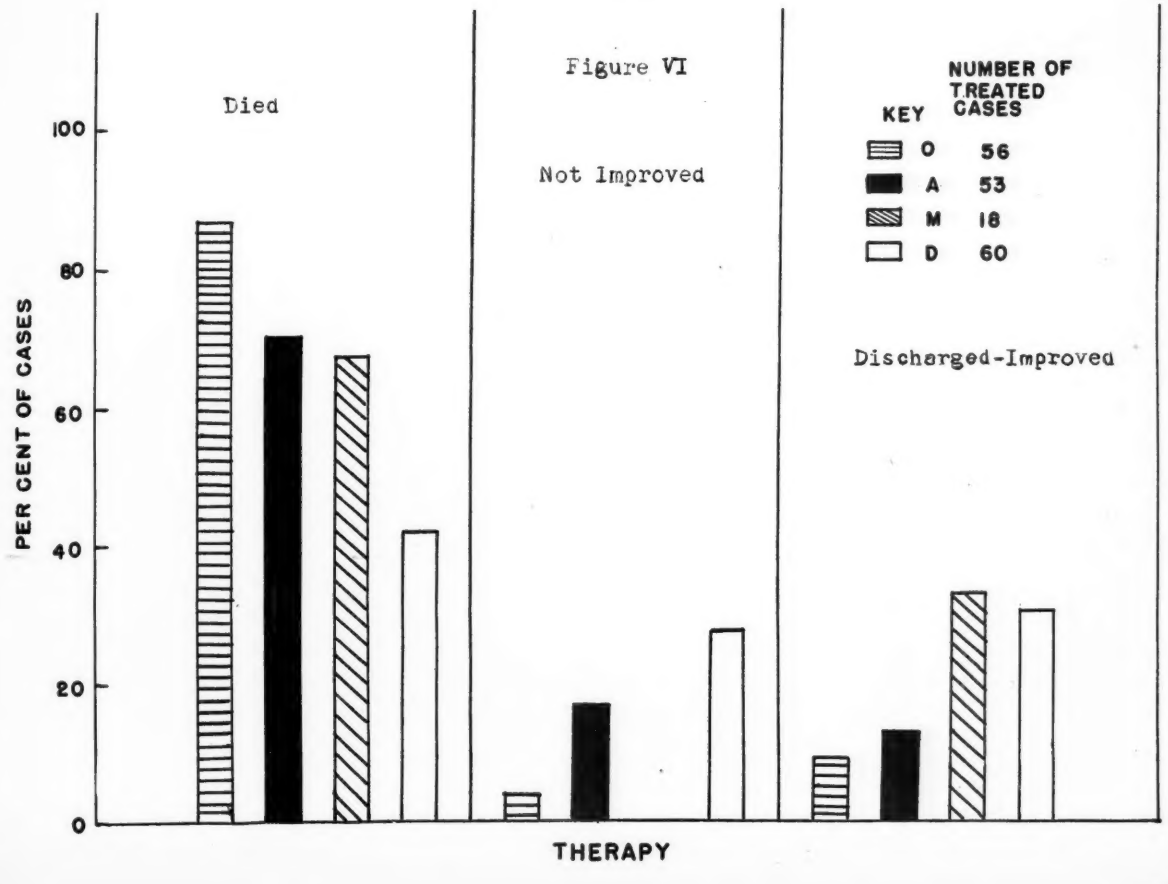
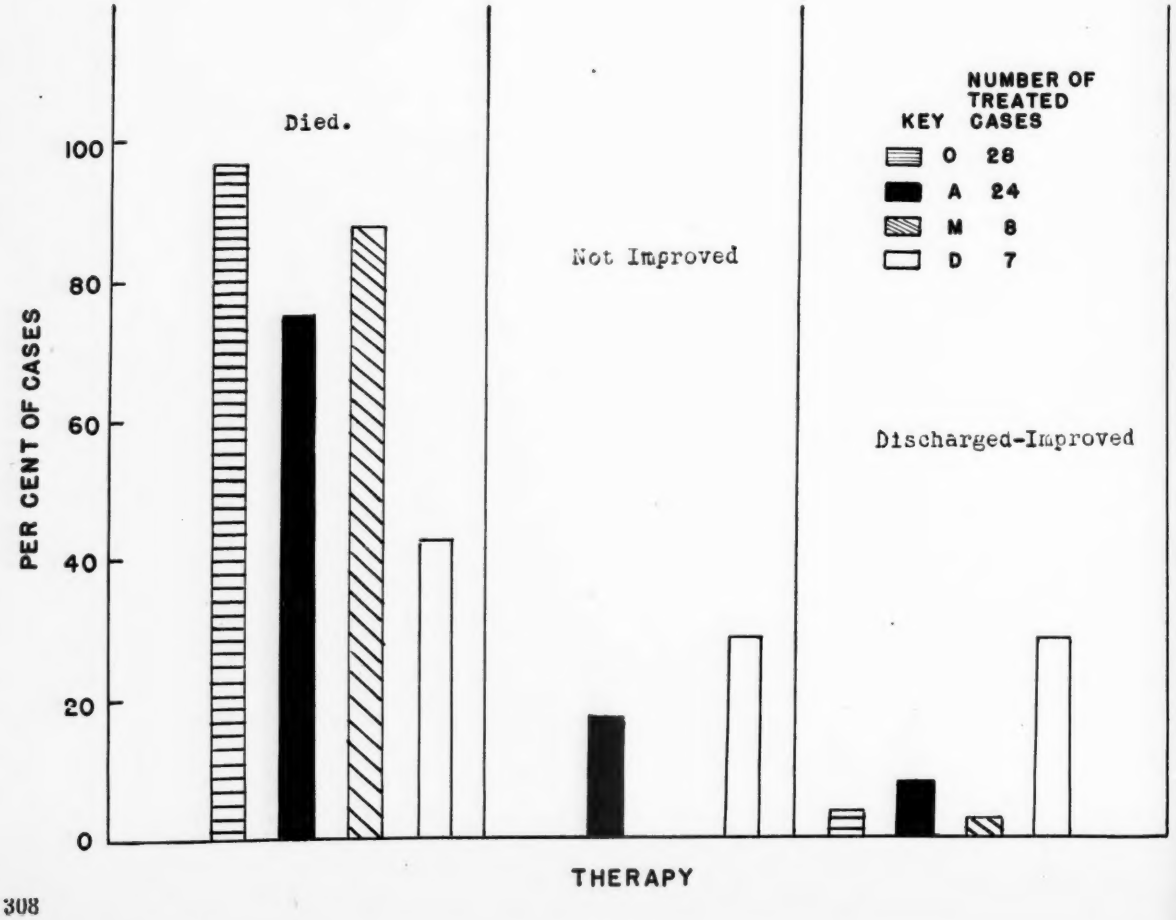


Figure VI

receiving active specific therapy. This is noteworthy. For instance, of the 43 cases admitted under 40 years of age who received "O" treatment 72.2 per cent died, while of the 125 similar cases receiving "D" treatment only 17.6 per cent died, a gain of 54.6 per cent of the lives. Correspondingly, the gain in the discharged-improved rate is 24.7 per cent. These figures have added significance from an economic standpoint for, it must be remembered, this age-group is in the so-called prime of life. Likewise it is noteworthy that the "D" treated group has the lowest death rate and the discharged-improved rate higher than any other form of treatment, and the same appears to be the case throughout all decades of life. However, the death rate increases and the discharged-improved rate decreases proportionately with age no matter what form of treatment is given, so that its effectiveness in patients 60 years of age or over is markedly reduced. On the other hand, when no specific therapy is administered in this age-group (Fig. 7), the death rate is almost 100 per cent. Thus it is obvious that even in older patients active specific therapy is of value because a considerable number of lives can be saved and repaired.

The two salient facts of this investigation, namely, that active specific therapy reduces the death rate in general paresis regardless of age, and that chemotherapy results in the lowest death rate and the highest discharged-improved rate during the first year of hospital treatment—these two salient facts suggest the means by which further progress may be made in the treatment of this disease. From their consideration, it would seem almost imperative that every general paretic patient admitted to the hospital be actively and specifically treated regardless of his age or physical condition. It would further seem almost imperative to start chemotherapy as soon as the diagnosis is suspected, without even waiting for confirmatory data. This is an important advance, because treatment heretofore has been delayed one or more months until the diagnosis of general paresis

Figure VII



was confirmed. The "D" form of therapy can always follow when the diagnosis of general paresis is certain.

One other item of importance in the matter of means by which further progress may be made is the cause of death in patients with general paresis. In a series of 499 consecutive autopsies performed on such patients (Table III) acute infection was found to be

TABLE III

ANALYSIS OF THE PRIMARY CAUSE OF DEATH IN 499 CONSECUTIVELY AUTOPSIED GENERAL PARETICS

Primary Cause of Death	*Number of Cases*	*Per Cent of 499*
Acute Infections	373	74.8
Tuberculosis	51	10.2
Trauma	32	6.4
Intracranial Vascular Lesions	19	3.8
Gummata	9	1.8
Malignant Neoplasms	6	1.2
Ruptured Aneurisms	5	1.0
Miscellaneous	4	0.8

the principal cause of death in 74.8 per cent. Naturally, the respiratory tract was the most frequently attacked, but acute infections of the renal, gastrointestinal, and cardiovascular systems were found in considerable numbers. This fact would indicate that the general paretic patient is particularly susceptible to acute infections. Since acute infection comes under the category of preventable diseases, another means of improving results is thus placed at our disposal. Furthermore, it is obvious that when an acute infection does affect the general paretic patient, it must be treated vigorously at the outset.

Summary

The results of treatment in 840 general paretic patients consecutively admitted to the Worcester State Hospital from January 1, 1920, to December 31, 1940, inclusively, were studied as to sex, the form of therapy given, and the age of the patient at the time of admission to the hospital.

No differences in the results were apparent between the sexes.

The group given no specific therapy had the highest death rate, 84.4 per cent, and the lowest discharged-improved rate, 11.1 per cent.

The use of specific chemicals alone was the next least efficacious method of treatment. Notwithstanding this fact, it was noteworthy that it resulted in the lowest death rate and the highest discharged-improved rate during the *first year* of hospital treatment.

In this institution, malarial treatment alternating with specific chemotherapy was not as effective as diathermy fever treatments alternating with specific chemotherapy. The latter method of treatment resulted in the lowest death rate, 28.7 per cent, and the highest discharged-improved rate, 37.4 per cent, with the probability of an even higher discharged-improved rate attainable during the next two years.

It was found that at least two years of "D" treatment was needed to discharge 88 per cent of the improved group, while the remaining 12 per cent needed more than two years of hospital treatment. However, even with the figures now at hand, the indication is that the death rate has decreased 55.7 per cent and that the discharged-improved rate has increased 26.3 per cent with "D" therapy.

It was also found that proportionately with age the death rate increased and the discharged-improved rate decreased regardless of the type of treatment.

An important fact was revealed in the group receiving no specific treatment in that the percentage of physical wrecks with general paresis entering the hospital dropped from 37.8 per cent during the 1920-1924 period to 8.5 per cent during the 1937-1940 period.

Conclusions

Noteworthy progress has been made in the effectiveness of treatment of the general paretic patient by diathermy fever combined with specific chemotherapy. The result has been a marked decrease in the hospital death rate and a marked increase in the discharged-improved rate.

However, further improvements in the results should be obtained (1), if all general paretic patients are given intensive antiluetic chemotherapy as soon as the diagnosis is suspected, regardless of age or physical condition, and (2), if specific chemotherapy is augmented by diathermy fever as soon as

the diagnosis is established. These factors should be of considerable help in further lowering the death rate and increasing the discharged-improved rate.

The prevention of acute infections in the general paretic patient will do much to lower the hospital death rate still further. To neglect acute infection means signing the death warrant of the general paretic patient.

A careful study is warranted to find the agent or agents responsible for a decrease of almost 30 per cent in the number of physical wrecks being admitted to the hospital with general paresis.

Neuropathologic Features of General Paresis in Relation to Mental Disturbances

D. ROTHSCHILD, M.D., *and* M. L. SHARP, M.D.*
Foxborough, Massachusetts

Dr. Rothschild graduated from McGill University in 1922. After an internship he became Assistant Physician at Foxborough State Hospital (Mass.) and served from 1927 to 1929 and from 1929 to 1941 as Senior Physician and Director of Laboratories. Until commissioned in the U. S. Army he was chief of the Male Psychiatric Service at Worcester State Hospital and Instructor in Psychiatry at Harvard Medical School. He is a Fellow of the American Psychiatric Association.

Dr. Sharp graduated from Tufts Medical School in 1932 and served one year general internship in St. Mary's Hospital of East St. Louis, Illinois. He has been Resident Physician at the Foxborough State Hospital since 1934 and Senior Resident Physician since 1937. He is a member of the American Psychiatric Association and a Diplomate of the National Board; also Diplomate of the Board of Neurology and Psychiatry. Dr. Sharp is about to enter active service with the U. S. Army.

Although the neuropathologic features of general paresis have been thoroughly studied, their relationship to the mental disturbances has received relatively little attention. It is recognized that special traits of personality may color the symptoms of any organic psychosis. In general, this is regarded as of psychologic interest but no practical importance in determining the course or outcome, for which the neurosyphilitic disease is held responsible. However, an earlier investigation[1] of the subject disclosed certain cases which were unusual enough to suggest that an unfavorable outcome might sometimes be attributable to factors of personality rather than to persisting or advancing cerebral changes. Since this view was based chiefly on clinical observations of selected patients, it seems desirable to approach the problem anatomically in an unselected group. Do the anatomic alterations of general paresis adequately explain the mental disturbances? Or does their relationship to the latter show inconsistencies pointing to important factors other than the neurosyphilitic process?

The material available for this study comprises 17 (10 male and 7 female) patients. Five had received no antisyphilitic treatment and three had been treated very inadequately. Eight had been given malaria and one artificial fever, with varying amounts of tryparsamide in all but one case.

The neuropathologic picture of general paresis, when uninfluenced by treatment, typically consists of an outspoken meningoencephalitis and degenerative parenchymal lesions. The former is manifested by perivascular collections of plasma cells and small lymphocytes in the cortex and diffuse infiltrations of these cells in the pia-arachnoid. The degenerative changes include loss and alterations of nerve cells, disturbances of the cortical architecture, neuroglial proliferation, often with numerous elongated microglia cells, the so-called rod cells, and an increase of iron, chiefly about the blood vessels and in the microglia.

Cases with Typical Anatomic Features—A typical picture as outlined above occurred in 7 cases (fig. 1). Four patients were untreated and one received bismuth only; two were given malaria but one patient died during the course of therapy. In these cases the severity of the anatomic changes was closely correlated with that of the mental disturbances.

Case 1, for example, showed more intense involvement than any other member of the group (fig. 1). Clinically too the severest symptoms were encountered, the patient displaying a galloping form of paresis in which

* Foxborough State Hospital.

death occurred four weeks after the onset of the illness.

Cases with Atypical but Severe Anatomic Changes—Three cases showed marked but atypical alterations. Two patients were given malaria, with fatal results in one, and one was inadequately treated. The changes were chiefly degenerative, sometimes with laminary or circumscribed involvement; they provide numerous points of histologic interest, but it is not our purpose to discuss such details. The clinical disturbances were consistent with the anatomic damage; though atypical in some respects, they were well developed organic syndromes.

Cases with Milder Anatomic Changes—This group included seven cases. Four patients received malaria and one artificial fever followed by tryparsamide, one was untreated and another was inadequately treated. In three of these the cerebral changes were on the whole consistent in severity with that of the clinical pictures. Malaria had been given with temporary improvement, followed by a slowly progressive decline and death 4 to 8 years later. The outstanding clinical symptoms were euphoric and grandiose traits and some intellectual dilapidation. Distinct peculiarities of personality were not noted. The anatomic picture was characterized by slight to moderate degenerative cerebral lesions and proliferative alterations of the small cortical vessels (fig. 2), with mild inflammatory phenomena in two cases.

In the four remaining members of this group a distinct lack of correlation between anatomic features and mental symptoms was observed. These cases require more extended consideration.

Case 2—F. G., a man, aged 64, had been blind and partially deaf since childhood. He was regarded as "very nervous," leading a sheltered life with his family. He did not get along well with his older sister, who was domineering. She suffered from an arteriosclerotic psychosis and died in March 1931. The patient expressed relief, saying that he would now like to enjoy life, but he soon developed numerous somatic complaints. He had crying spells and talked of suicide. He

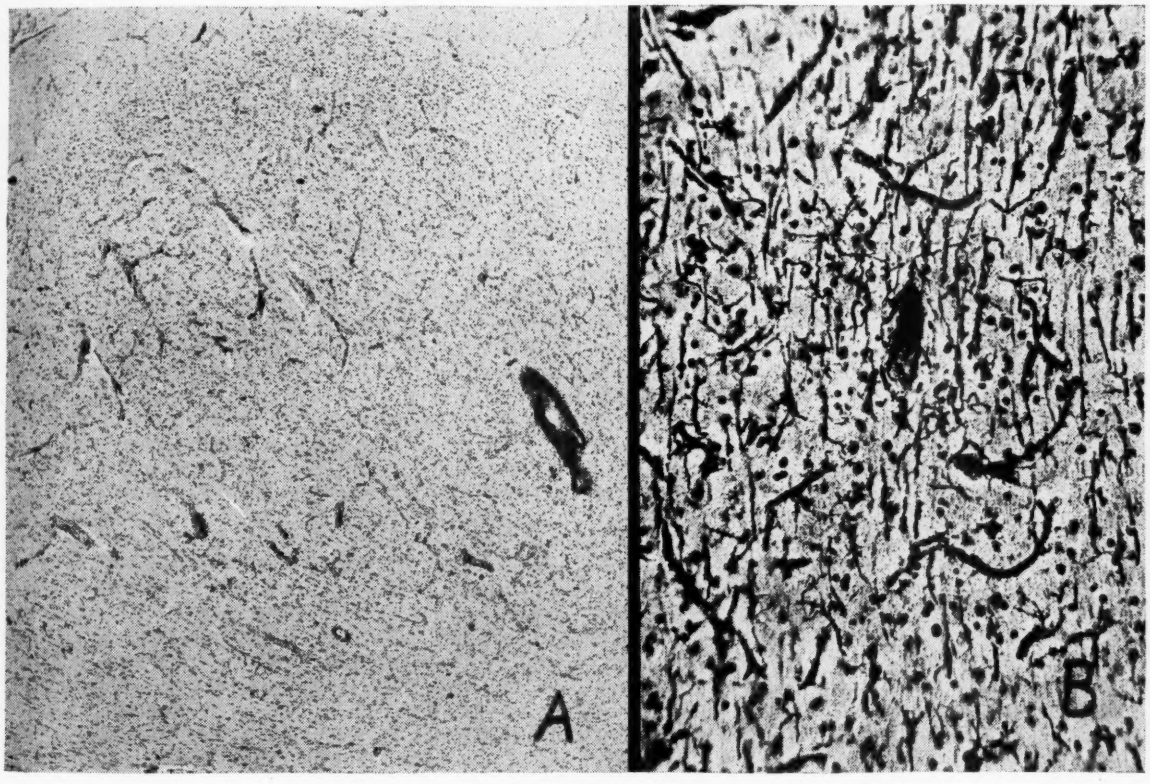


FIGURE 1 (CASE 1)

Intense inflammatory and degenerative cerebral changes in a case of galloping paresis. A, many small and large perivascular infiltrations of small lymphocytes, with a disturbed cortical architecture, loss of nerve cells and neuroglial proliferation. B, silver stain of the cortex showing microglial proliferation in the form of large "rod cells" arranged in parallel rows.

became unsteady on his feet and untidy in habits and showed increasing confusion and restlessness. He was hospitalized on September 22, 1931, and remained in a state of profound confusion until death occurred 12 days later from coronary thrombosis. The Wassermann reaction of the blood was positive but the spinal fluid was not examined. No antisyphilitic treatment had been given. The brain exhibited granular ependymitis of the fourth ventricle. The pia-arachnoid was thickened, with occasional collections of small lymphocytes, chiefly at the base. The cortex was well preserved (fig. 3), though there were rare perivascular infiltrations of small size and slight neuroglial proliferation.

Comment—This mild neurosyphilitic process was completely out of harmony with the severe mental disturbances. Evidently the patient's resistance to cerebral damage was unusually low. His obviously handicapped personality and the recent stress in his family life pointed to personal factors which made him so vulnerable mentally that extremely mild anatomic involvement sufficed to produce devastating clinical effects.

Case 3—A similar though less striking case was that of C. H., a man, aged 45. As a child the patient had been pampered, requiring greater attention than his siblings. After an unsuccessful marriage his life was aimless and improvident. He developed a typical grandiose-demented picture leading to hospitalization within 12 months. Four injections of tryparsamide were given, but the patient showed increasing confusion, and death occurred 2 months after his admission. The Wassermann reactions of the blood and spinal fluid were positive and the colloidal gold curve was 0000112333. The brain exhibited moderate lymphocytic infiltrations in the pia-arachnoid and around vessels in the brain stem, endarteritis of a few vessels,

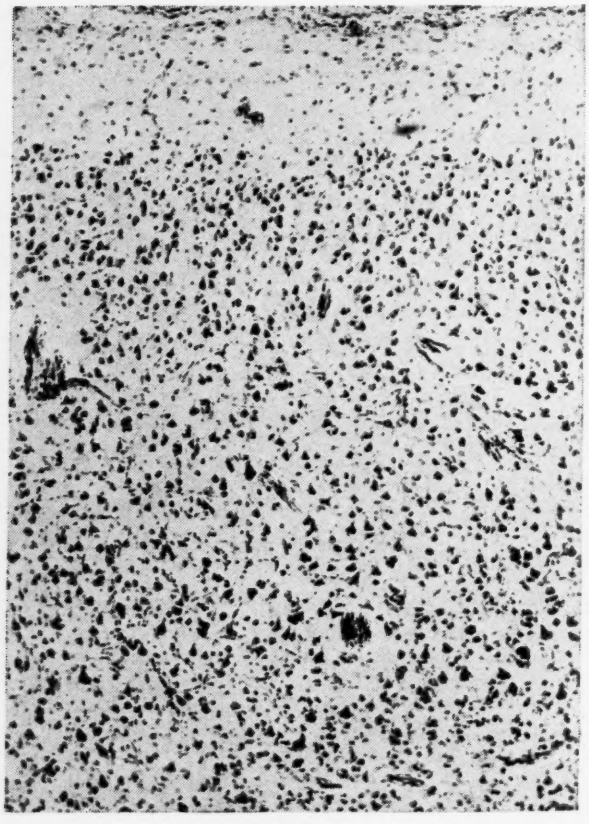


FIGURE 2

Section illustrating a more chronic picture commonly resulting from malarial therapy. The cortical vessels are thickened, with scarcely any infiltrative phenomena. Persisting parenchymal changes are manifested by disarrangement of the cortical architecture, alterations of nerve cells and neuroglial proliferation. Clinically a correspondingly chronic picture was observed.

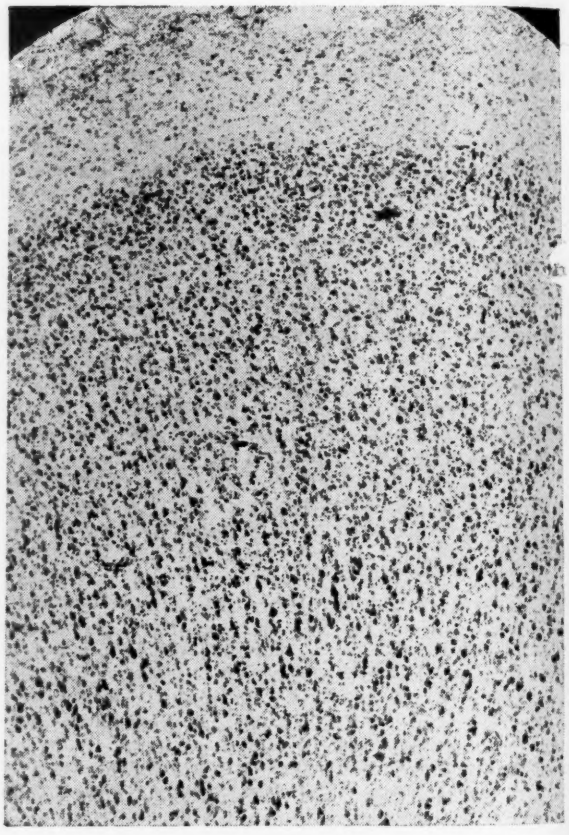


FIGURE 3

Section from case 2 illustrating a mild but untreated neurosyphilitic process associated with severe and rapidly progressive mental symptoms. The cortex is fairly well preserved though its architecture is slightly disturbed. There is moderate neuroglial proliferation.

and only mild cortical alterations consisting chiefly of slight neuroglial proliferation and occasional small perivascular collections of round cells.

Comment—The foregoing case, like case 2, displayed atypical pathologic involvement, with meningeal alterations predominating. The changes were more marked, but regardless of their type seemed insufficient to account for such severe and rapidly progressive mental disturbances. As in the preceding case, the patient was highly vulnerable mentally by reason of an inadequate personality, and as a result he offered little resistance to a relatively mild anatomic process.

In the two following cases with marked discrepancies between anatomic and clinical phenomena, features suggestive of schizophrenia were prominent.

Case 4—A woman, aged 33, was admitted to the Foxborough State Hospital on July 22, 1933. Her parents were addicts to alcohol, and as a child she was allowed to "run wild." From the ages of 8 to 14 she was promiscuous sexually. In 1913 she became a state ward. In foster homes she was dull, untruthful, unreliable and immodest. Because of these traits she was admitted to the Boston Psychopathic Hospital on September 28, 1916. She was discharged 9 days later with a diagnosis of mental deficiency, without psychosis. Her mental age was given as 9.5 years. She was married in 1922. Although she submitted to sexual intercourse before marriage, she objected to it afterwards. This led to increasing disharmony and a separation 3 years later amid stormy scenes. There was one son, aged 9, who was well. Little is known of her activities during the next few years. She was apparently able to support herself by working in the kitchen of a small institution. She lost her position shortly before admission to the hospital. On July 14, 1933, she was picked up by the police in a dazed and excited condition. She was taken to the Boston Psychopathic Hospital, where she remained for six days. She showed odd and variable behavior and a diagnosis of dementia precox was made.

Examination—The patient was dull, inactive, suspicious and uncommunicative. At times she made peculiar motions, as though reacting to hallucinations, and at other times she maintained peculiar postures for long periods. Vague ideas of persecution were expressed. Apparently, she was disoriented for time and place, but so far as could be determined her memory was fairly well retained. Physical or neurologic abnormalities were not noted. The Wassermann reactions of the blood and spinal fluid were positive. The spinal fluid contained 56 cells per cubic millimeter; the total protein was 54 mg. per 100 cubic centimeters and the colloidal gold curve was 0012332100.

Course—During her stay in the hospital the patient was for the most part mute and inactive, with incontinence of urine and retention of saliva in the mouth. She developed odd and inconstant twitching movements of the head. On rare occasions she responded sufficiently to suggest that she was in at least partial contact. Later she showed occasional sudden outbursts of restlessness and violence. Several epileptiform seizures occurred. She was given bismuth and in October 1934 malaria (13 paroxysms), followed by 8 injections of tryparsamide and prolonged bismuth therapy. The Wassermann reaction of the spinal fluid was positive on two occasions prior to malarial therapy but thereafter became negative. The blood Hinton test remained positive. The patient developed a severe anemia which proved intractable to treatment and there was considerable bleeding from hemorrhoids. She gradually grew weaker and died with signs of lobar pneumonia on November 20, 1939.

Neuropathologic Observations — The brain showed slight fibrotic changes of the pia-arachnoid in a few places. The cortical architecture was well preserved, though some nerve cells were pale. There was mild microglial and astrocytic proliferation and a few cortical vessels were slightly thickened (fig. 4).

Comment—Cases of general paresis with symptoms reminiscent of schizophrenia have been explained by most neuropathologists as a direct expression of the neurosyphilitic process. Thus, Gurewitsch[2] claimed that they corresponded to atypical anatomic changes and Jakob[3] was convinced that the special nature and distribution of the lesions was the important factor. We were unable to confirm their observations, and both Jakob and Gurewitsch admitted that some of the cases under discussion could not be charac-

terized anatomically with any degree of certainty. Moreover, these arguments neglect an important point, namely, that the mild neuropathologic changes in the present case are not really atypical, since they are similar to what is observed in many thoroughly treated patients,[4] regardless of the presence or absence of schizophrenic-like features.

In view of the foregoing observations, the schizophrenic-like features must be attributed to some factor other than an anatomic one. They seem understandable, in the present case at any rate, as a manifestation of special personal characteristics. Fertile ground for their development was provided by the poor family background, faulty upbringing, low intellectual endowment, peculiar personality and difficulty in adjusting to social requirements. According the Angyal and Gyárfás,[5] dementia paralytica may precipitate a true schizophrenic psychosis, and the two diseases can continue to exist side by side. Evidence in support of their views was advanced in an earlier study,[1] and a similar interpretation might be applied to the present case. Thus, the early serologic changes were indicative of active neurosyphilis; the occasional convulsions occurring later pointed to an organic disorder, and the mild cerebral changes were consistent with a healed or arrested paretic process. On the other hand, the clinical picture was dominated from beginning to end by symptoms suggestive of a catatonic form of schizophrenia. But whether or not these symptoms constitute an independent disorder, they represent a major and highly personal contribution to the total picture.

Case 5—A negro, aged 44, developed an illness which at first seemed typical of general paresis, with grandiose tendencies, restlessness, confusion and characteristic serologic changes. The patient was given artificial fever therapy followed by tryparsamide, receiving 234 grams of the drug during a stay of 3 years in the hospital. The clinical picture soon altered; antagonistic and threatening conduct and seclusiveness were in the foreground, with incoherence and possibly some degree of confusion. Later, mute and

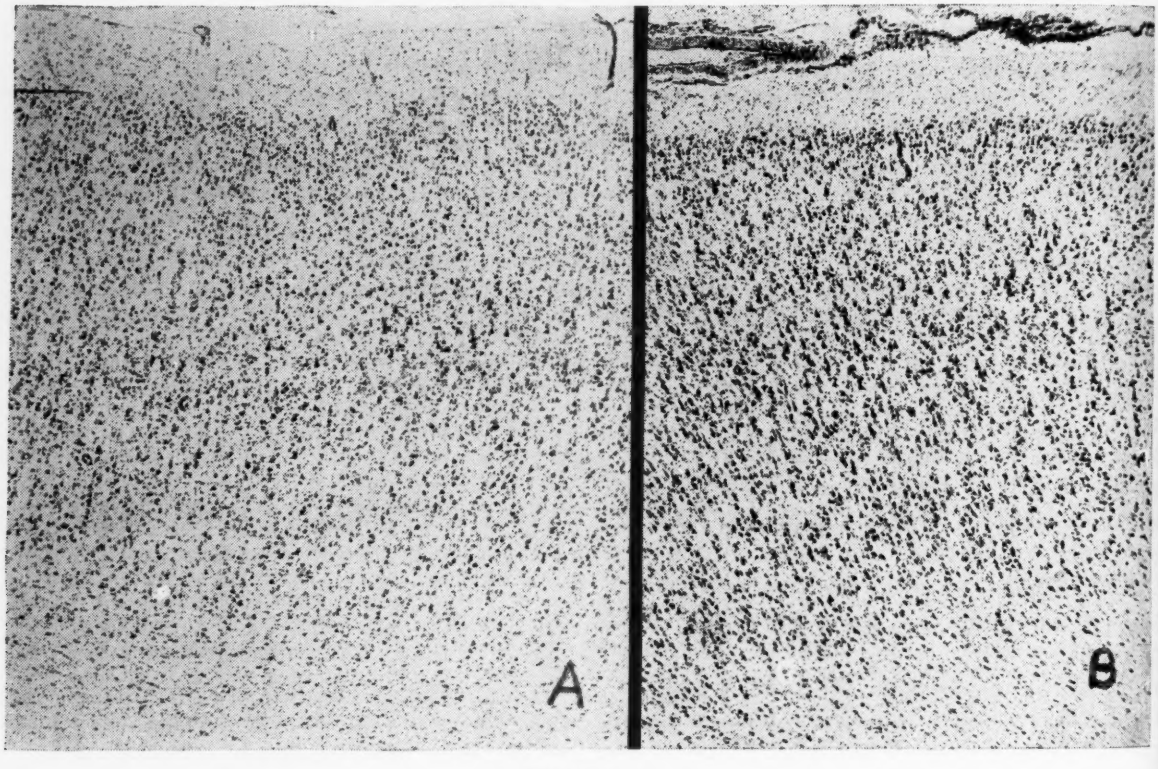


FIGURE 4

Sections from case 4 (A) and case 5 (B) illustrating an arrested or healed paretic process, with clinical features suggestive of schizophrenia. The cortex is well preserved, apart from slight disarrangement of its architecture. A few small cortical vessels are slightly thickened, and there is mild neuroglial proliferation. In B the pia contains a few lymphocytes and plasma cells.

negativistic traits and sudden outbursts of assaultive behavior were interspersed with quiescent periods in which the patient was able to do simple work. Death occurred from pulmonary fat embolism three days after he had sustained two fractured ribs and contusions of the lungs and small intestine during a fight. The brain showed scattered plasma cells and lymphocytes in the pia-arachnoid. Rare and inconspicuous perivascular collections of these cells were observed in the cortex. The nervous parenchyma was well preserved, apart from slight neuroglial proliferation and indications of mild disarrangement of the cyto-architecture in a few places (fig. 4).

Comment—In this, as in the previous case, the symptoms were strongly suggestive of schizophrenia. The sudden accidental death afforded the opportunity to examine the brain while the psychotic disturbances were still at their peak. Yet the cerebral damage was very slight. Unfortunately, adequate information concerning the background and personality of the patient could not be obtained, so that it was not possible to demonstrate traits pointing to a vulnerable mental make-up. Nevertheless, in the light of the considerations put forward in case 4, the explanation for the unusual clinical features is to be sought in factors of a personal nature and not in the impersonal neurosyphilitic process.

General Discussion

In most cases of general paresis the course of the illness and the severity of the clinical disturbances show a fairly close correlation with the severity of the neuropathologic changes. Even in these cases there is no concrete evidence that variations in the nature or distribution of the process directly determine finer qualitative differences in the individual mental pictures.

In a small but not inconsiderable group the anatomicdamage does not satisfactorily account for the mental phenomena. Here factors of personality seem to play an important role. Thus, some patients (cases 2 and 3) who showed only a mild neurosyphilitic process were so vulnerable mentally that they were unable to resist the slight damage, succumbing almost without a struggle. Others (cases 4 and 5) displayed a special type of vulnerability leading to the development of a schizophrenic-like picture; these patients had been thoroughly treated, and from a neuropathologic point of view the process could be regarded as arrested or healed. It seems reasonable to believe that clinical arrest or healing would also have occurred if underlying morbid tendencies had not existed.

Since the advent of malarial therapy, cases presenting schizophrenic features have been noted with increasing frequency, and it has been claimed[6] that they owe their origin to changes produced by the treatment. But as Gurewitsch[2] has pointed out, similar cases occurred prior to the use of malaria in neurosyphilis. In one of our cases the symptoms suggestive of schizophrenia were plainly observed before any treatment had been given. In this connection it must be remembered that general paresis is in most instances a severe and progressive disorder when left to itself. If not checked, its destructive impact would, no doubt, completely shatter any individual mental characteristics of a well developed nature. Modern methods of treatment often succeed in curing, arresting or retarding the paretic process. In doing so, hitherto latent weaknesses may be allowed to produce disturbances which take over a dominant role in the whole clinical picture. These disturbances become manifest in some way as a result of neurosyphilis, but beyond that they are expressions of special personal traits which are not amenable to specific therapy. For a favorable outcome in general paresis it seems that a basically sound personality is necessary in addition to effective antisyphilitic measures.

Summary

The relationship between neuropathologic changes and mental disturbances was studied in 17 cases of general paresis.

In 13 of these the severity of the clinical disturbances showed a fairly close correlation with that of the cerebral alterations.

In 4 cases a lack of correlation between anatomic phenomena and mental symptoms was observed. In this group factors of personality seemed to play an important role. In two of the cases, mild cerebral damage was able to produce devastating clinical effects, because the patients were vulnerable

mentally by reason of an inadequate make-up. In the other two the cerebral changes were indicative of an arrested or healed paretic disorder, but features suggestive of schizophrenia dominated the clinical picture. These features could not be attributed to the anatomic process; they were regarded as an expression of special personal traits.

The observations suggest that a favorable outcome in general paresis depends not only on effective antisyphilitic measures but also on a sound personality.

References

1 Rothschild, D.: "Dementia Paralytica Accompanied by Manic-Depressive and Schizophrenic Psychoses," *Am. J. Psychiat.*, 96:1043, March 1940.

2 Gurewitsch, M.: "Die pathologisch-anatomischen Besonderheiten der progressiven Paralyse unter Berücksichtigung der klinischen Befunde und der Malariabehandlung," Schweiz. *Arch. f. Neurol. u. Psychiat.*, 35:271, 1935.

3 Jakob, A.: *Anatomie und Histologie des Grosshirns*, vol. 2, in Aschaffenburg, *Handbuch der Psychiatrie*, Franz Deuticke, Leipzig and Vienna, 1929.

4 Wilson, R. B.: "Histopathological Changes Following Malarial Treatment of General Paralysis," *Brain*, 51:440, 1928.

5 von Angyal, L., and Gyárfás, K.: "Die Prognose der schizophrenen Form der progressiven Paralyse," *Ztschr. f. d. ges. Neurol. u. Psychiat.*, 153:753, 1935.

6 Dattner, B.: *Moderne Therapie der Neurosyphilis*, Wilhelm Maudrich, Vienna, 1933.

ABSTRACTS

UNIDIRECTIONAL ELECTROSTIMULATED CONVULSIVE THERAPY. By Dr. Emerick Friedman, Norwich State Hospital, Norwich, Connecticut. Presented at the Massachusetts Society for Research in Psychiatry on April 21, 1942.

A description of the procedure for conducting convulsive therapy by unidirectional wave forms is given. Several wave forms were applied with and without commutator interruptions. It was found that the partially smoothed rectified wave at 60 per sec. with commutator interruptions at 10 per sec. was most efficient in terms of least convulsive dose (maximum incidence at 16-30 mA. for 1-2 sec. or 46-60 mA. at 0.1-0.3 sec.). Out of 128 mixed cases that completed treatment 59 (46%) underwent remissions and 25 (19.5%) had showed improvement.

A COOPERATIVE ONE TO TWO YEAR FOLLOW-UP SURVEY OF RESULTS OF METRAZOL TREATMENT IN TEN MASSACHUSETTS MENTAL HOSPITALS. By Dr. William L. Holt, Jr., Westborough State Hospital, Westborough, Massachusetts. Presented at the Massachusetts Society for Research in Psychiatry on April 21, 1942.

Three hundred and fifty-three patients were given metrazol treatment during the year ending March 31, 1940, and their condition evaluated in April, 1941. Some 322 received no other form of shock therapy. These were divided into 231 schizophrenic patients and 91 with other diagnoses. The schizophrenic patients average 30 years of age, had been ill 38 months before treatment, were given 13 convulsions and 51% were returned to their homes, 24% were recovered, 37% were improved and 39% were unimproved. The 91 non-schizophrenic patients averaged 39 years of age, had been ill 21 months, received 12 fits and 68% were at home 1-2 years later, 58% were recovered, 22% improved and 20% unimproved.

NEWS NOTES

KANSAS PSYCHIATRIC SOCIETY ORGANIZED

Recently a group of 35 practicing psychiatrists met at the Menninger Clinic, Topeka, Kansas, to organize the Kansas Psychiatric Society. A constitution and by-laws were formulated and adopted and the following officers elected: President, Dr. Robert P. Knight, Menninger Clinic, Topeka; Vice-President, Dr. G. M. Cowan, 1st Lieut. (M.C.), Ft. Leavenworth; Sec'y-Treas., Dr. Edward D. Greenwood, Menninger Clinic, Topeka.

An Executive Committee was appointed composed of the officers, Dr. M. L. Perry, Superintendent of the Topeka State Hospital, and Dr. Karl Menninger. Meetings are held quarterly at which scientific programs are presented. At the first meeting, Dr. Robert L. Worthington of The Menninger Clinic spoke on "German Psychological Warfare."

The society was accepted for affiliation with the American Psychiatric Association.

Why a Popular Journal?

Diseases of the Nervous System is again selected to publish the Annual Symposium of the Massachusetts Society for Research in Psychiatry. Last year, we were privileged to publish their articles under the title "Symposium Dealing With Problems of the Aged" and "Investigations in Gerontology." That issue enjoyed a large circulation, to be exceeded by the current issue.

Future issues of the journal will be devoted to similar symposia concerned with timely topics in the field of psychiatry and neurology. This monthly periodical always contains short but complete and interesting articles written by outstanding specialists.

SPECIAL SUBSCRIPTION OFFER

We have a limited number of back issues in stock. As long as the supply lasts, we will present each new subscriber gratis with all issues of DISEASES OF THE NERVOUS SYSTEM published in 1942.

To take advantage of this opportunity, just fill in the coupon below and mail with your check for $2.50.

PHYSICIANS POSTGRADUATE PRESS,
500 North Dearborn Street,
Chicago, Illinois.

I enclose my remittance for $2.50 for which you will please send me, prepaid, the issues of Diseases of the Nervous System of January through August, inclusive, and one year's subscription to the publication, Diseases of the Nervous System, commencing October, 1942.

Name.....

Street.....

City..... State.....

Book Reviews

FUNCTIONAL NEUROANATOMY. By Wendell J. S. Krieg, Ph.D., Philadelphia, Pennsylvania. Blakiston, 1942. Pp. 553, xx. 274 illus. with 27 plates, mostly by the author. $6.50.

Most books on neuroanatomy reflect the student's opinion of the subject as being cut and dried. Standard sections, with descriptions carried down from one author to another through succeeding generations—with hundreds of names to be learned! Krieg makes neuroanatomy come to life. The names are there, of course, and they must be learned, but their significance is greatly enhanced through being linked with one another and with systems and structures that begin to mean something. The author has applied a graphic technic in his illustrations that brings in the third dimension, the so-called phantom drawing. This alone makes the book worth having. Furthermore, there is just enough of developmental and comparative anatomy to make understandable the errant course of the old-time bundles and tracts whose divagations are so incomprehensible to the beginner. This is especially true of the olfactory system, the bete noire of both student and scholar.

The author is that rare combination of teacher and philosopher with talent for drawing. It seems worth while in this review to quote his own "ten commandments" which have been faithfully adhered to. Would that other authors might follow this lead!

1. Proceed from the simple to the more complex.
2. The text should be addressed to the student, rather than to the specialist.
3. Structures shall not be named until they are to be described. Then they shall be described completely and in one place.
4. Structures shall not be described or bounded in terms of others not previously encountered.
5. Every described structure, relation or appearance shall be illustrated, and that illustration referred to in the exposition.
6. Structure, function and disease shall be integrated into one account wherever possible.
7. The burden of terminology shall be reduced to a minimum. Synonyms are not to be introduced. Short terms in current use are to be chosen.
8. Laboratory work shall be carefully planned and correlated with textual matter. The conditions limiting actual observation of specific points shall be stated.
9. Controversies are not to be aired *in extenso*, but doubtful points are to be indicated, and problems stated. Opinions of individuals and their names are not to be introduced.
10. As each phase of the text is being prepared the existing literature is to be conned and actual preparations studied or made, no matter how familiar the subject may be.

There are statements in the work here and there that represent opinions held formerly but now disproved by newer researches; but the field of neuroanatomy is being so vigorously prosecuted at the present time that not a single individual can be expected to keep them all in mind. Doubtless the author will make some revisions in future editions. There is also evident a limited acquaintance with clinical neurology; but these are minor criticisms. The work is a pleasure to read. The publishers are also to be congratulated on the format they have given this superlative work. The type and the illustrations both serve to make the cut-and-dried subject come to life again.

Walter Freeman, M.D.

PSYCHOTHERAPY IN MEDICAL PRACTICE. By Maurice Levine, M.D. Pub. by The MacMillan Co., 1942. Pp. 320.

Too often books are reviewed for the purpose of pointing out their defects. In this review, it may be stated at once that whatever faults this book may have, its values only are of primary importance and it should be read for the practical information it contains.

It is written for general practitioners and those medical specialists other than the psychiatrists who so often are the first to see the early cases of mental disorder and who need to have an adequate understanding of how much they really can do and when it becomes necessary to send the patient to the psychiatrist.

The first chapter lists and discusses 24 common misconceptions, such as the pessimistic attitudes about the role of heredity in mental disease, of masturbation, pre-natal influences and over-work in causing mental disorder, and of marriage and punishment as therapeutic measures, all items on which the general practitioner needs ready information to correct his patients' misunderstandings. The second chapter lists the various methods of psychotherapy and the common mistakes made. The next three chapters deal with the methods of psychotherapy for the general practitioner, for the general practitioner with some specialized training and for the specialist. There follows an important chapter on suicide, a danger much too frequently overlooked and discounted, with a carefully detailed discussion of the behavioral indications of possible suicide. The next chapter, the study of psychogenic factors, is essentially a brief outline of the procedure of the mental examination with discussion of the topics needing more extensive investigation.

Chapter VIII, *Choice of Cases*, is essentially a simplified version of the psychiatric classification of mental disorders, with a clarification of those

cases best handled initially by the general practitioner. There follow straightforward practical chapters on *Sex and Marriage, Basic Attitudes Toward Children, The Problems of Parents and Children,* and *Normality and Maturity,* all of which are of significant value to those not interested in specializing but who properly need fundamental understandings to permit adequate utilization of that common sense derived from experience in general medicine.

The final chapter lists and discusses those books that are most valuable to the general practitioner and which the specialist takes pride in keeping on his shelves for general reference. Additionally, in many of the chapters, mention is made of particular books covering special topics. The book is well indexed and, in this reviewer's opinion, will be read with pleasure and satisfaction.

Milton H. Erickson, M.D.,
Eloise Hospital, Eloise, Mich.

HIGHLAND HOSPITAL, Inc.

Affiliated with the Psychiatric Department of Duke University. For the modern treatment of mental and nervous, and habit disorders.

Robt. S. Carroll, M.D., Medical Director
Asheville, North Carolina

Garceau Electroencephalographs

TWO-CHANNEL ELECTROENCEPHALOGRAPH

- *A. C. Operated*
- *Inkless Writing*
- *Require No Shielding*

For precision localization of cortical lesions, Garceau Electroencephalographs are available in models with from 2 to 20 channels.

The two-channel electroencephalograph is provided with a total of 16 active scalp electrodes, connectable to the amplifying channels in every possible combination by the built-in selector switches.

Electro-Medical Laboratory, Inc.
Holliston, Massachusetts, U. S. A.
Makers of the Junior Garceau Electroencephalograph

50 Beds THE RETREAT, Inc. Est. 1905
DES MOINES, IOWA

For the diagnosis and treatment of Nervous and Mental Disorders in a homelike environment.

RUSSELL C. DOOLITTLE, M.D., *Medical Director* SYDNEY L. MACMULLEN, *Business Manager*
RICHARD S. AHRENS, M.D. HOWARD V. TURNER, M.D., *On Leave* FRANCIS J. WARNER, M.D.

Member Central Neuro-Psychiatric Hospital Association

GLENSIDE
JAMAICA PLAIN, BOSTON, MASS.

A small, attractively located sanitarium for nervous, mild mental or chronic illnesses.

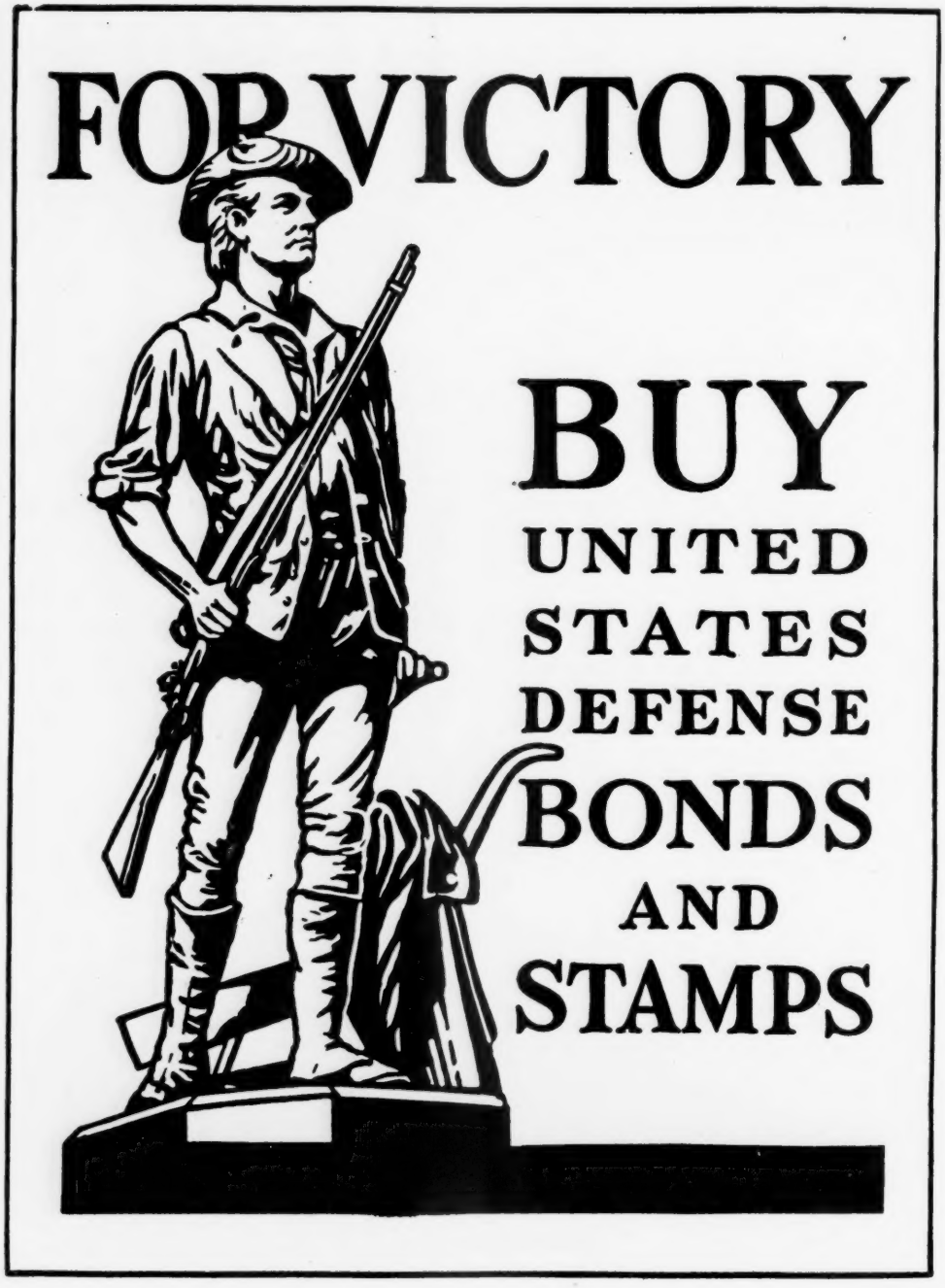
MABEL D. ORDWAY, M.D.
6 Parley Vale Tel. Jamaica 0044

TWIN PINES
BELMONT CALIFORNIA

Devoted to the Individualized Care of Selected Mental Cases

Homelike surroundings in small individual cottages distributed over twenty-four acres of wooded park with ample recreational facilities.

WILL REBEC, M. D., *Medical Director*


FOR VICTORY
BUY
UNITED
STATES
DEFENSE
BONDS
AND
STAMPS